

MEMORIAL

OF THE

Union Merchants' Exchange

OF

SAINT LOUIS,

TO THE

FORTY-THIRD CONGRESS OF THE UNITED STATES.



A STATEMENT OF THE NECESSITIES OF THE PEOPLE OF THE MISSISSIPPI VALLEY, IN RESPECT TO THE TRANSPORTATION OF THEIR PRODUCTS, AND THE IMPROVEMENT OF THEIR NATURAL & CHANNELS OF COMMERCE.



ST. LOUIS:

THE R. P. STUDLEY CO., PRINTERS AND BINDERS, 221 NORTH MAIN STREET.
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MEMORIAL.

TO HON. JAS. G. BLAINE,

Speaker of the House of Representatives:

The undersigned, a committee appointed for the purpose by the Union Merchants' Exchange of St. Louis, respectfully ask leave to present through you to the Congress of the United States, a statement of the necessities of the people of the Mississippi Valley, in respect to the transportation of their products, and the improvement of their natural channels of commerce.

We see, with gratitude and pleasure, that the Congress of the United States has recognized, by the legislation of successive years, the propriety and need of improvement of those navigable waters which traverse this broad interior basin. Nor do we forget that by authority of Congress, and under the direction of the proper executive department, some of the most needful improvements have already been completed or commenced. But we believe that the necessities of industry and commerce now call for a more comprehensive plan and a more speedy completion of such improvements than has heretofore been contemplated in legislation.

For years the movement of bulky products of western agriculture to eastern consumers has been much embarrassed, both because of the enormous quantity of such products needed by one section and abundantly supplied by the other, and because their small value per ton, as compared with many other fruits of industry and chief objects of commerce, renders a costly transportation peculiarly burdensome to those who consume, and still more to those who produce them. The quantity of vegetable food moved in a single year by only five routes eastward, has been nearly 5,600,000 tons; by other routes probably 800,000 tons more were moved in the same direc-

tion, while a quantity not accurately ascertainable, but doubtless exceeding 1,000,000 tons, also goes southward to consumers. Statistical examination of the production and consumption of food in the northwestern States, of which details are given in the first of Appendices accompanying this memorial, indicate that ten of those States have a surplus available for shipment to meet deficiencies elsewhere, in a year of full crops, of about 364,000,000 bushels of cereals, of which about 238,500,000 bushels go eastward. The remainder so largely exceeds probable shipments southward, as to warrant the belief that a quantity, by no means inconsiderable, remains unsold, and is wasted or consumed beyond the actual requirements of the people of this region, in consequence of the lack of adequate facilities for its economical transportation. In addition to the cereals, about 2,400,000 tons of other agricultural products now seek a market at the east. But the routes upon which over 8,000,000 tons of agricultural products have thus to depend for transportation eastward, are at the same time required to move over 2,500,000 tons of forest products, and 900,000 tons of petroleum besides nearly 1,000,000 tons of manufactured iron and other articles toward tide-water, and the same routes move though not wholly eastward, nor over their full length, more than 9,000,000 tons of coal. Of these enormous quantities, so large a proportion is moved over the same part of the chief routes, and in the same direction, that blockades and delays, costly alike to commerce and to the transporter, cannot always be avoided by the utmost skill.

Agriculture is moving westward with surprising rapidity. In 1850 Pennsylvania, but in 1873 Minnesota, produced more wheat than any other State in the Union. Growing population creates increasing demand from the older States; the region south of the lakes which formerly supplied the east, has steadily decreased in production, and in 1873 more than half of the wheat produced in the northwestern for consumption in the eastern States, or for export, was grown in States west of the Mississippi river. As the distance between producer and consumer widens thus rapidly, the cost of transportation becomes every year to both a matter of more vital concern. Financial and industrial disorder has impressed upon the public mind the conviction that, by some mode, our interchange of products must be effected at less cost. The true and only solution of this problem, as we believe, lies in the fact that a bushel of wheat or corn, if it be launched upon the navigable waters nearest to either of the chief grain producing districts of the West, and follows the natural water-currents without interruption or other motive

power will be found within forty days in the Atlantic ocean, close to the harbor of New York. Nature itself supplies, in the Mississippi River and the Gulf stream, a route from the very districts in which the largest surplus of grain is produced, to the very region in which the demand for consumption most largely exceeds production. Upon that route nature adds, free of cost, a motive power, aiding every eastward bound vessel, in the natural currents flowing, at the rate of about four miles an hour, from St. Paul to the Gulf, and from the Gulf along our Atlantic coast.

The localities from which grain must be moved settle the question as to the fitness of different routes. They prove that a beneficent Providence, when it bestowed upon certain regions of our land extraordinary fertility, traced also for each one of them a natural route of cheap transportation by water flowing to the sea. A map accompanying this memorial, drawn from the crop-map for wheat in the census report of 1870, shows the outlines of six districts of greatest fertility, of which the most productive lies almost wholly west of the Mississippi River, in Minnesota and Iowa, and produces, according to careful estimates, a surplus beyond the consumption of those States of about forty-five million bushels of wheat. A second extends along the Missouri River, in Iowa, Nebraska and Kansas, and produces an estimated surplus of three million bushels. A third lies along the Mississippi River in Illinois and Missouri, embracing every county from Quincy nearly to Cairo, and produces an estimated surplus of nearly fourteen million bushels. A fourth extends along the Wisconsin and Fox Rivers, and produces about fifteen million bushels. A fifth extends through Central Michigan, touching Northern Indiana, producing not more than five millions; while the sixth, embracing counties in the Miami Valley, Ohio, and reaching across the Wabash Valley, in Indiana, produces an estimated surplus of nearly eleven million bushels. Detailed examination by counties shows that, in addition to an estimated surplus of 47,786,738 bushels produced in States west of the Mississippi river, more than twenty-six million bushels of the surplus of wheat are produced in localities from which the Mississippi and its navigable tributaries afford a natural outlet. Thus, of an estimated surplus of 92,895,857 bushels of wheat produced in the Northwestern States, about 74,250,000—or nearly eighty per cent.—are grown in districts to which material benefit from improvements of the Mississippi River and its chief tributaries would surely extend.

Another map, drawn from the crop map of corn in the census report, shows at a glance that the most productive districts in that

cereal also lie close to the navigable rivers. By far the largest and most productive lies along the Illinois River, and extends across the central part of the State, between the Illinois and the Wabash. An estimate of consumption by counties, though only of approximate value, suffices to indicate that, of a surplus of about sixty-eight million bushels available for shipment, though not all actually shipped from that State, about sixty-two millions were produced in counties nearer to the river than to the lakes, and thus within reach of the advantages to be secured by a system of improvements which shall render available a competing route to the southward, closing later and opening earlier than the route by the lakes.

A second corn-producing district, extending through Iowa, Nebraska and Kansas, yields an estimated surplus of twelve million bushels; a third, lying in the Scioto and Miami valleys of Ohio, produces about fourteen million bushels; so that, out of a surplus of about one hundred million bushels of corn, about ninety-three per cent. lies within reach of the advantages offered by improvement of the natural water channels to the sea. The same benefits would be shared by the producers of about two-thirds of the surplus of oats, more than half the surplus of barley, nearly two-thirds of the packed meat, and the entire crops of tobacco, hemp, cotton, sugar, and molasses. Thus, more than six out of nine million tons of agricultural products, not required for consumption in the States from which they come, seek transportation from districts to which the Mississippi and its chief tributaries, if rendered available for cheap transportation, offer a route more readily accessible than any other by water.

In the rapid development of our country, the location of the surplus of these products has advanced so far to the westward that the cost of moving it by rail to the lakes has, in effect, closed the route by lake and canal to a large proportion of that surplus. It is a startling fact that the quantity of agricultural products moved eastward by the New York canals has decreased 810,074 tons since 1862, the very year in which the enlargement of the Erie canal was completed. But the quantity of vegetable food moved by the New York Central, Erie and Pennsylvania railroads has increased from 956,754 tons in 1862 to 2,770,614 tons in 1872. The railroads actually move not only every bushel of grain added since 1862 to the surplus of the West, but in 1872 over 810,000 tons of the quantity formerly moved by canals. This is in part because the enlargement of the canals has wholly failed to produce the expected reduction in cost of transportation. Official records show that while the State

of New York has reduced its tolls one-half, or \$1.06 per ton from Buffalo to Albany, the charges of the transporters are not only higher than they were in 1862, but have averaged, since the reduction of tolls, for 1870-'72, inclusive, \$2.44 per ton, whereas the average for the years 1858-'61, inclusive, was only \$2.03 per ton. Official records also show, that in 1869, even with rates higher than \$2.44, the transporters suffered severely, and began to look for other employments. It must be concluded that the rates are as low as can be reached by the present method of operating; that the enlargement, by increasing the time required for trips, the cost of boats and haulage, and the capital losing interest when the canal is not fully employed, has more than neutralized any gain by use of larger boats; and that farther enlargement would be of questionable benefit. The records show, moreover, that the eastward cargoes have to bear nearly the whole cost of the return trip, since tolls on eastward are to tolls on westward freight as eleven to one; that the irregularity in the movement of products is such that the average employment of transporters during the past six years has been equivalent to $5\frac{1}{2}$ months of full work yearly, and that the rates on grain, averaging a little less than 11 cents per bushel, in May and June, rise in the fall with remarkable regularity when the crops begin to move, and for three years have averaged $12\frac{3}{10}$ cents in September, and $13\frac{9}{10}$ cents in October, and $14\frac{3}{8}$ cents in November. The importance of these facts in their bearing upon the cost of transportation by that route, and the possibility of securing lower rates, either by enlargement of New York canals, or construction of others subject to the same conditions, will be appreciated.

But it also appears that the lake as well as the canal now moves a smaller proportion of the grain of the West than it did in 1862. and that the same causes, in a measure, affect the cost of transportation by that method; that a fleet capable of moving from Chicago 11,500,000 bushels in one month, actually moves only 60,000,000 bushels in a season, a quantity equivalent to full employment for only $5\frac{1}{5}$ months: that the eastward freight greatly exceeds the westward; and that in spite of rates higher than were obtained before the war, and rising especially in the fall months, when the greater quantities of grain are moved, the increase of vessels on the lakes has been in no degree proportioned to the increase of crops moved eastward—a fact which indicates that even the rates now obtained are not found especially profitable to carriers. Accordingly, though 40,385,490 bushels of grain were shipped from Chicago eastward in 1862 by lake, and only 876,982 by rail, it appears that

in 1872 the shipments by lake were 59,354,353 bushels, but by rail 16,575,043 bushels. In effect of the total shipments of grain (flour not included) from that point, the proportion shipped by lake has decreased from 98 to 78 per cent., and the proportion shipped by lake to the canals from 84 to 42 per cent.

The chief cause of these remarkable changes, we believe, is the westward movement of the center of agricultural surplus. Transportation by railway can be effected at much lower cost per ton per mile, and is performed at very much lower rates, for long than for short distances. The larger surplus-producing districts at the West are nearly all at such distance that for transportation from them to lake ports about ten cents per bushel is charged. Two transfers by elevator, on the route eastward by water, and the rates on lake and canal (at the average for three years past), make the entire charge by that route, from such points to New York, about 35 cents per bushel, besides insurance, while from many of the same points grain is moved every summer, by rail all the way, at rates ranging from 30 to 36 cents per bushel. Able to transport all the year—during the winter at their own prices—and thus to earn interest on capital, while the canals are closed by frost, the railways can carry at cost, or even below it, during a part of the summer, until the larger movement of grain in the fall invites the carriers by lake and canal to make up for lost time by higher charges. Thus, even from Chicago, the head of lake traffic, the rail rates to New York, as recorded by the Board of Trade, averaged for the whole year 58 cents per 100 lbs., and during the whole season of navigation 54 cents, although at one time the rate was but 45 cents. This power of the railways to charge at pleasure, except during a short time in the summer, can only be restrained by competition from another water route, open during a larger part of the year than the route by the northern lakes. And the influence of high rates from the chief surplus-producing districts to the lakes, can only be checked by the competition of another route by water, leading directly from these districts to the sea. Otherwise, the farther the center of the grain-surplus moves westward, the greater will be the advantage of the route by rail over the route by lake, and the more complete the dependence alike of the western producers and eastern consumers upon a mode of transportation necessarily much more expensive than by water.

Careful examination of the freight rates of the leading railways since 1853, shows that while there has been a very general reduction in average freight charges per ton per mile, amounting, upon lead-

ing trunk lines eastward, to about twenty-four per cent. since 1862, and while competition between such roads has pushed the rates so low, in almost every year, as to yield no returns to the capital invested in one or another of the competing lines, nevertheless, that competition has not sufficed to materially reduce the charges, according to published rates, for movement of grain eastward. The ordinary rates were substantially the same in 1872 and 1860. Either the rates originally offered, in order to secure this important traffic were quite as low as the roads have since been able to concede with profit, or the chief trunk lines, by securing control over, or combinations with the multitude of minor roads intersecting the country in every direction, and by careful adjustment of local rates, to prevent diversion of traffic to other routes, have been able to gain vastly in the quantity of grain moved by them, without permitting competition to materially disturb their rates. In the nature of the case, competition in the movement of this product, between parallel routes to the eastward is very limited; each has a territory from which grain cannot be profitably transferred to the other. The same principle applies to the multitude of branch or connecting roads; they can compete only at a few points, and the producer is usually dependent wholly upon that road to which he is nearest. A route southward cutting all these roads or their dependencies at a multitude of points, extending navigable branches into almost every considerable surplus-producing district in the west, offering to almost every western road an independent route to which it may move freight, in a multitude of cases, more profitably than to either of the eastern trunk roads, seems to us to give absolutely the only permanent and generally effective protection to producers. It will break up and render worthless, a host of combinations for the control of traffic. Railroads will usually prefer to secure freight for themselves a longer instead of a shorter distance, and in hundreds of cases, the western roads which now carry a short distance to an eastern trunk, could then carry a longer distance to a navigable river, making money themselves by the change, and at the same time saving money to the producers. When we consider the great number of navigable streams reaching out from the Mississippi, the vast territory traversed by its branches, and the peculiar proximity of the chief grain producing regions to those branches or to the river itself, it is clear that competition offered by that free highway, unlimited in capacity, and closed from this city southward an average of only eighteen days in the year, will be worth more to the producers of the West and the consumers of the East, than all other competition attainable or conceivable.

A freight railway to the Atlantic is by many advocated. To build it would cost the people, if not their Government, five times as much as all needful improvements of the Mississippi River. When built, it would open a new route for not more than forty counties from the Alleghanies to the Mississippi, and few of these in the surplus-producing regions; improvement of the river would open a new route to forty-two counties in Illinois alone. When built, the railroad would compete in practical effect, with one or two roads only—those nearest it in territory; but the Mississippi would compete with every road which penetrates a grain-producing district west of Portage, in Wisconsin, La Salle, in Illinois, or south of Terre Haute and Columbus.* Comparison of freight rates of nearly all the more prosperous roads in the country, with their ton-mileage, net earnings, and cost of construction, appears to establish the fact that while only nine of them could pay interest on their bonds outstanding, if charging an average rate of only one cent per ton per mile, scarcely one of them could at that rate pay interest on the actual cost of construction. It is hardly believed that any new railway, without long established business or contributing branches and feeders, would be able to carry at lower rates than any roads have been able to reach with these great advantages. Yet one cent per ton per mile is 32 cents per bushel from the Mississippi River at the nearest point to New York, and that is just the rate at which a company in St. Louis, as early as 1868, began to move grain from Dubuque to New York, at times when the river, without improvements, afforded sufficient water for cheap transportation. One-fifth of the cost of a freight railway, expended in improvement of the river, would not only secure that rate, at all times when navigation is not stopped by ice, but one very much lower, for ten months in the year from Dubuque, and for twelve months from Cairo. The hope that a rate lower than one cent per ton per mile can be established and maintained, either by legal regulation of existing railroads, or by building of new roads, is not warranted by any statistics in the history of our railway system.

The location from which the surplus products of the West are to be moved excludes from consideration, as measures of national relief, nearly all the projected water-routes from this valley to the Atlantic coast. Important as some of them are to local interests, useful as some would be to the producers of a single district, not one of them reaches or would afford a cheaper outlet to as much as one-seventh of the surplus product of the Northwest, in cereals alone. The history of the Erie Canal has proved that difficulties inherent in that

mode of transportation expose it to fatal competition from railways whenever they are able, and the canal is not, to penetrate directly to the districts from which freight is to be moved. But for this difficulty, the James River and Kanawha Canal might reach and relieve producers in Illinois and Iowa ; but transportation seven hundred miles against the current of the Ohio, costing now five dollars per ton in the regular movement of iron ore—a freight moved as cheaply as grain—and afterwards two hundred miles against the current of the Kanawha, New, and Greenbriar Rivers, would give to the railways an advantage absolutely fatal in competition, even if the Ohio were not closed by low water during the very months in which the most important crop is largely moved. Improvements of the Illinois or Wisconsin and Fox Rivers would not permit the passage of fleets of barges by which alone grain is economically transported on the upper rivers, nor can canals or locked streams be profitably navigated by vessels from the lake ; and hence these routes would not give relief, even by competition during the season of lake navigation, except each within a narrow belt. Thus, neither these, the proposed canal across Michigan, the Georgian Bay and Toronto Canal, nor the Niagara Ship Canal, would remove the three fatal difficulties which are so rapidly depriving the northern route of usefulness—namely, that it does not reach the chief surplus-producing districts, but leaves them dependent upon rail or other costly transportation to its western terminus ; that its competition does not fully restrain railway charges more than two months in the year, nor at all more than six months ; and that it has no economical mode of delivery from the lakes to Eastern consumers.

Enlargement of the Erie Canal aims to remove only the third difficulty. But the last enlargement was followed not by a reduction but by an increase in the cost of transportation. The same difficulty, and no other, would be in part removed in proportion as the cost of transportation from the lakes to Troy or New York should be reduced by success in the use of steamers adapted to the present capacity of the canals, or steam barges adapted to an enlarged canal, or a ship canal from the St. Lawrence to the Hudson. Substitution of steam for horse-power gives a mode of operation much cheaper while in use, but far more costly when idle, because the larger capital employed demands its daily interest, and the more costly hands employed their daily wages. Detailed examination of these plans appears to prove that by neither of them can the cost of transportation be materially reduced,—by steamers not more than one cent per bushel, if at all ; by the Caughnawaga Ship Canal not

more than one and one-fifth cents, if at all; and by the Oswego enlargement not lower than eighteen cents per bushel from Chicago to New York; nor is it believed that a rate as low can, by that route, be maintained. Meanwhile, improvement of the Welland and St. Lawrence Canals will soon make it possible to transport grain from Chicago to Montreal, at a cost of 14.7 cents per bushel—an advantage sufficient to deprive New York of the export trade in grain, and the canals of the only grain traffic which they now retain. Yet a transfer at Montreal, and transportation thence either to Troy, New York, or eastern consumers, by any route discoverable, would make the grain cost more than it now costs by water routes which are unable to compete with the railroads in supplying food to eastern cities. Thus, while England may get food at lower cost, our own people in eastern, as well as the producers of the western States, must remain dependent upon railroad charges as long as the northern route by water is the only one utilized; for that route, no matter how improved, can effectively compete only during a few weeks in the summer; can compete only within a territory close to the lakes, or to such large water channels as may be constructed from them; can compete only to the extent of the demand for export, and that to render us dependent upon a foreign city; and can by no method be so improved as to check the exclusive privilege which the railroads possess, in reaching at the West the multitude of farms, and at the East the multitude of factories.

There is but one route which can now, or at any future time, answer this necessity. It is a route by which steamers already reach two hundred and thirty out of the seven hundred and twenty-two counties in the nine Northwestern States (Michigan not included), and many of the most productive counties in every district of especial fertility. But it is also a route by which steamers now reach every State except one in which there is a deficiency of cereals, and nearly every large city or manufacturing center in those States. By it food can be gathered from farms bordering upon sixteen thousand miles of river navigation, and delivered all along the Atlantic coast, and upon any of its bays and navigable streams. Unlike any other route contemplated, it offers, both at the West and at the East, effective competition at a great multitude of points, where now railway transportation has a complete monopoly in our domestic exchanges. Nor does it offer independence to domestic commerce alone, but by that route and no other can grain be placed on the wharves of New York at less cost than in Montreal.

Thus marvellously adapted to our national necessities by its loca-

tion, it also surpasses all other routes, existing or contemplated, in cheapness of transportation. Of 220 railroads, embracing nearly all the most important, not one carries at a lower rate than 13 mills per ton per mile. Records for forty-three years, of the cheapest transportation by artificial water-ways in this country, prove that the lowest rate ever reached was $6\frac{7}{100}$ mills, by the New York canals in 1859. Records of lake navigation for twenty years show that even in the one year of general prostration, 1858, when its rates were lower than ever before or since, the charge was still $11\frac{3}{100}$ mills per ton per mile, while the average is $31\frac{0}{100}$ mills per ton per mile. But every year, when there is water enough for navigation, transportation is effected on the Mississippi and Ohio at a cost of barely one mill per ton per mile. It is true that this is in the movement of coal, and that the tow-boats return from the lower river without the empty barges, thus saving some time and fuel. But this rate is reached with a channel greatly impeded by low water and obstructions, and so irregular in navigation as to involve charges for idle time and unemployed capital. To illustrate how completely nature has planned this route, as if to anticipate that which our ripest civilization finds its chief obstacle to the economical transportation of agricultural products, namely, their periodicity of movement, and the consequent non-employment of costly facilities during a part of every year, a map (to be found in Appendix H) has been prepared, showing at a glance the location of the chief surplus-producing districts of each important crop. From the Balize to St. Paul each latitude has its peculiar products and times of movement. Any route crossing the Mississippi Valley from west to east must depend for employment chiefly upon the products of one latitude, and facilities sufficing for the demand of one season must in other seasons be in part idle. But the improvement of the natural highway, which crosses in succession fifteen degrees of latitude, and drains with its navigable waters the very districts in which the natural products of each latitude are most abundantly produced, will offer to the transporters, in mid-winter, employment in the genial regions of the South, in moving to northern consumers the crop of sugar and molasses, and, at the same time, extending into spring, in the transportation of cotton southward from the broad belt six hundred miles long, which reaches almost from the mouth of the Ohio to the mouth of the Red River. With early spring the tobacco of Kentucky and Tennessee seeks a market; nor can it be wholly moved before the unlocking of northern tributaries sets free that part of the corn crop which has been imprisoned by ice through the winter. Larger than any other crop,

this will fill every boat and barge until the winter wheat begins to move in July, and the spring wheat of lower latitudes in August. With September comes the vast wheat surplus of Minnesota and western Wisconsin, and late in November, when the ice closes navigation from St. Paul southward, the new corn has already begun to flow out from the Illinois by the million bushels. When that stream closes, the rail will deliver at St. Louis or Cairo all winter, and, meanwhile, a new cotton crop demands attention. Every month, by Nature's route, is employed in moving Nature's gifts.

Statistics which accompany this map will give some idea of the remarkable influence which this distribution of products has upon the cost of transportation. While a route, penetrating one of the most fertile regions of the northwest, finds employment equivalent to only four and a half full months, and even then has half its rolling stock employed in returning westward, almost empty, it is not strange that capital invested in costly cars and engines, of which many earn nothing two hundred and ninety days in the year, claims heavy wages for the service that it renders during the seventy-five days in which its cars are filled. But for this difficulty, also—the prevailing lack of return cargoes for transporters eastward—nature has provided on her favorite route. In part, because different latitudes maintain constant interchange of products, cheap transportation by this route is possible, but still more, because the powerful current with which nature favors the out-going and bulky products, enables a given motive power to take down as many boats fully loaded, as it can bring back empty. The most economical employment of force is therefore, by this route, the movement southward with the heavy cargoes from western farms, and the return with comparatively light but valuable products of manufacture, or of foreign countries, which bear higher rates of freight. So completely has nature thus provided every condition for the most economical transportation, that, while sixteen thousand tons of freight have been taken southward at once by a single tug—while rates actually charged upon this river every year for the transportation of grain, whenever the water suffices for full cargoes, are lower per ton per mile than those charged on the lakes, or for transportation by any other mode anywhere in the country—yet a very large proportion of the present cost, low as it is, can be removed by securing to commerce an unobstructed channel. With ten feet of water at all times from this city to the gulf, and with the mouth of the river open to the largest vessels of ocean navigation, thus assuring a free outlet for western products, not even the transporters themselves can say at how low rates freight

may be moved with fair profit. Comparison of rates already attained, whenever there is water enough for free navigation, with those which carriers are forced to charge during the low water season, even in times of sharpest competition, only shows in strong light the great benefits which may be conferred, alike upon commerce, upon consumers, and upon producers, by fully utilizing this great gift of a favoring Providence, to the people of this nation.

This route is neither new nor untried, but only undeveloped. For many years nearly all the grain moved from the Mississippi Valley, either to the Atlantic States or to Europe, was floated down the Mississippi. Those who imagine that the heat or the humidity of the climate through which it passes will injure grain or other agricultural products, will search in vain the records of more than forty years of experience for a single instance to sustain their theory. Grain stored at the South, under circumstances far more trying than those to which shipment by the river and Gulf expose it, is not injured; grain from California crosses both tropics and the equator twice in sailing vessels, during its long voyage, and yet commands a high price in the English market; grain is moved to that market every year from Chili, Australia, Egypt, Morocco, Bengal, and Burmah, all by routes exposing it for weeks to a climate far more tropical than any to which a shipment by way of the Gulf is exposed for three days only, and yet commerce meets no injury and fears no risks. Until 1860, wheat, flour and corn were shipped by way of the Mississippi every year from States as far east as Ohio and Indiana, already traversed by railroads and canals to the lakes, and to New York, Boston and Philadelphia, and other points on the Atlantic coast. It is simply incredible, if grain thus shipped had sustained injury, except from causes liable to injure it in any climate, or while transported by any route, that consumers in the eastern cities and merchants of the west still continued, year after year, to expose millions of bushels of grain, and property worth millions of dollars, to that injury while other and shorter routes were open. Nor are there wanting the most conclusive tests in experience of shipments since the war. During the summer of 1869, the Grain Association of this city, shipped 160,000 bushels of wheat in seven successive cargoes, and all were minutely inspected in Liverpool. In two of the cargoes not a bushel was damaged, in one cargo one and two-thirds bushels, in another four bushels, and out of 160,000 bushels, just 120 $\frac{1}{2}$ bushels were found injured. What road has moved 480 car loads of wheat in any season with damage to so little? Corn is shipped every year in considerable quantities by way

of New Orleans, and the merchants who sell and the merchants who buy unite in declaring that up to this date, in all their experience, they do not know a single instance in which sound corn, shipped in a proper vessel sustained injury, This is the more noteworthy because it is well known that in northern latitudes, where changes of temperature are more sudden and severe, corn has often been known to spoil in a railroad car within a very few hours, and "steam-corn" in the New York market, and "hot corn" in northern elevators, are phenomena not so rare as to excite surprise. Several of this committee have handled grain largely, and we desire to add, as the result of our experience, that we believe that sound grain shipped in a dry vessel, is even safer in southern than in northern latitudes.

The large movement of grain by way of New Orleans, though it had steadily increased for many years, was suddenly checked during the decade which preceded the war. Careful inquiry shows that this arrest of the natural outflow of grain was due to a very simple cause—the sudden increase in the tonnage and depth of vessels employed in trans-Atlantic commerce, which, beginning when the famine in 1848 in England caused a large movement of breadstuffs, culminated in 1853. From that very year the grain shipments of New Orleans ceased to keep pace with the increase of production at the West. The vessels in which grain could be most cheaply transported were too large to pass the bar at the mouth of the river with safety, and to that cause alone, we believe, was the coincident arrest of the shipments by that route actually due. Deprived at that point of the use of the natural highway to the sea, the west began to expend its wealth by hundreds of millions in the building of artificial highways to the east. Since that time, two periods of commercial disaster have warned the nation that it is spending too much in railway building, expending too much every year in effecting its exchanges by a mode necessarily costly, and allowing its great industries to become too completely dependent upon a system which, with all its excellencies, is still capable of being much abused. Well may we ask whether it would not have been better for us, if of more than two thousand millions which have been expended in building artificial routes, we had long ago taken the one-hundredth part to open and perfect that route by which alone, from this time forward, can the railway system be, through competition, effectively restrained from abuse.

It is not the primary object of this memorial to urge the adoption by Congress of particular measures for the improvement of the

Mississippi river and its tributaries. The yearly reports of scientific engineers, who are enabled by appropriations to make careful examinations and surveys, place before Congress a great body of information which to the public is not generally accessible. Nor has this committee, appointed but two months ago, had opportunity for such inquiry and investigation as would warrant an attempt to set forth in detail the improvements needed. But it is proper here to point out the chief obstacles which now block the commerce of this valley, and to give authority for the belief that they can be removed, and for an estimate of the cost.

Of all obstacles, the greatest is that which arrested the natural commerce of this valley in 1853—the bar at the mouth of the Mississippi river. Its practical effect is wholly to exclude from the port of New Orleans ocean vessels of the larger size, in which grain is now most advantageously transported; to deter vessels, even of a second class, from entering that port except for cotton, a cargo which fills and pays for space without corresponding increase of depth; and to make it impossible, for these and even for vessels of a third class, to take out with safety full cargoes of grain or other heavy freight. In consequence, grain can be shipped only at rates higher than ocean commerce maintains whenever it is unimpeded; other bulky freights find other routes the cheaper; and even of cotton, more than 500,000 bales have been moved to eastern factories by rail within a single year. The most competent engineers place the cost of ocean-transportation at one mill per ton per mile. At that rate grain from New Orleans could be moved to Liverpool for 15 cents per bushel; the usual cost is 25 cents. To New York should cost not more than 6 cents, at that rate; the actual cost is about 12 cents. But a still graver difficulty is that vessels do not come to New Orleans, except for cotton, in sufficient number to move, only partially laden as many must be, that proportion of bulky products which could even now, with a river much obstructed, and with freights from that port unnaturally high, be advantageously shipped by that route. Every year merchants of this city find it impossible to secure freight room from New Orleans for quantities of products to which that route would be the cheapest. Even the outward movement of the tobacco crop from New Orleans has been disastrously checked within the past year from the same cause.

The commerce of this valley absolutely needs thirty feet of water from New Orleans to the Gulf. It is idle, when dealing with an industry which measures its yearly surplus of products in hundreds of millions, to talk of partial relief, when complete and permanent

relief is attainable at a cost insignificant in comparison with the advantages to be gained. A depth of water which would still exclude some of the larger ocean vessels, would only serve as an excuse for continuance of unnatural charges. The commerce of this Valley demands a port free to all. Nor is it impossible, or even difficult, to attain that result. Since engineering science in Europe has caused one of the smaller mouths of the Danube to cut out for itself a channel twenty feet deep, and has united the Red Sea and the Mediterranean by a ship canal, there can be no question that by either method it is perfectly practicable to completely remove the obstacle at the mouth of the Mississippi. It is not the province of this memorial, but of those skilled in engineering, to determine which method may in this case be most advantageously adopted; some information as to the nature and cause of the bar, and the plans for relief, are, however, appended. From the official statement of the United States Engineer in charge, it appears that a ship canal of sufficient depth can be constructed at a cost of \$7,500,000.

But this work, or any other for permanent relief, will require time. The industry and commerce of the Mississippi Valley need immediate relief. Official statements appended, show that the dredge-boats in service do great good, but have not yet the force which the Chief of Engineers years ago recommended; that the cost of operating the two in service is only \$150,000 yearly; that one of them is nearly worn out, and that two new boats would cost \$600,000. We earnestly ask that a sum sufficient to set at work on the bar two new boats, as speedily as possible, may be appropriated, and that the officer in charge may be instructed to maintain, and by Congress and the Executive Department may be sustained in every manner necessary to maintain, the greatest possible depth of channel (not exceeding 30 feet at low tide), until such measures of permanent relief as Congress may choose to adopt shall have been completed. We pray, further, that the regular and ample appropriations needful for that purpose may henceforth (until the completion of permanent works) be regarded as equally necessary with those for the maintenance of the light-houses upon our coasts.

The chief obstacle to the navigation of the river is yet the rapids near Keokuk. The injury done each year to the producers and the commerce of this Valley, by the unnecessary delay in completion of the works there in progress, cannot be estimated. Fully respecting the desire of Congress to exercise economy in expenditure, we beg leave respectfully to urge that in this case delay is not economy, but waste of the public funds, as well as sacrifice of public interests.

We therefore pray that the full sum, by the Engineer in charge deemed necessary for the completion of this work with the least possible delay, may at once be appropriated.

Next in importance, with respect to national commerce, are the obstructions in the channel of the Mississippi below the mouth of the Missouri, and mainly between that point and the mouth of the Ohio. The engineer in charge of that portion of the river—a statement from whom is appended—unhesitatingly declares that it is practicable, at moderate cost, to secure a depth of ten feet in the channel at all points, and at the lowest stage of water. In his statement there is quoted an estimate of his predecessor, that the necessary works, from the mouth of the Missouri to the mouth of the Ohio, would cost less than \$3,000,000. Of the cost of applying similar methods to the remaining obstructions below the mouth of the Ohio, no official estimate is before us. We, therefore, respectfully ask that the Congress will make at once, such appropriations as may, from official reports, be found necessary—first, to carry out as speedily as possible the recommendations of the engineer in charge, as to improvements between the mouth of the Missouri and the Ohio; second, to cause the river below that point to be officially examined, and the cost to be ascertained of extending the same system of improvement, so that from the mouth of the Missouri to the Gulf, ten feet of water in a channel 200 feet wide, may be obtained at all times; and third, that, upon the receipt of such report, Congress will make the further appropriation required to effect that result.

Of the importance of this portion of the channel, it is enough to say that it is part of the main trunk, by which the surplus products of Missouri, Illinois, Iowa, Kansas, Nebraska, Minnesota, and Western Wisconsin, may have an outlet to the sea, open from the mouth of the Missouri nearly the whole year, and capable of bearing, without over-crowding, even the 80,000,000 bushels produced for shipment by Illinois, and the 45,000,000 bushels of wheat from Minnesota and Iowa. Without improvement at that point, the route would remain to all these States practically closed after August 1st, during the very season in which their most valuable crops hasten to market.

Snags and wrecks, not less than sand-bars, still obstruct the navigation of the Mississippi and its tributaries, notwithstanding the very effective and beneficial work done already by authority of Congress. The officers in charge of the snag-boat fleet report that new, stronger, and additional boats are needed, and show that the full efficiency of the existing fleet has not yet been realized for want of appropriations sufficient to keep it constantly in service. We also

respectfully represent that the removal of wrecks, whenever they obstruct the channel, should be at once undertaken, with ample appliances, and that it should be made the duty of the officer in charge, upon proper notification of the location of a wreck, new or old, to proceed to remove it before it has gathered such deposits as to obstruct or change the channel, and to render its removal more difficult. That this work may be undertaken, and that the excellent service already being done in removal of snags may be continued with largely increased force, we respectfully task that the sum of one million of dollars may be appropriated.

It is not designed, in specifying these improvements—which seem to be of the broadest national importance—to imply that other works for the improvement of the navigable tributaries, and of the Mississippi above the mouth of the Missouri, should be abandoned. On the contrary, we respectfully but most earnestly represent that there is absolute need that this great river, with all its navigable tributaries, shall henceforth be considered the nation's highway, and cared for by the nation's Government. It is not in a sectional spirit that we recall the fact that the States which border upon this natural channel to the sea have borne, in peace or in war, a large share of the burdens of the Government. But it is not for their own interest alone that they now most earnestly pray the Government to adopt a plan of improvements as comprehensive as the benefits to be derived from it are vast. If seven and a half millions should be expended at the mouth of the river; if five millions should be expended in opening a clear channel of ten feet from the mouth of the Missouri river; if one million more should be expended in removal of snags and wrecks; and if, to carry forward with more vigor, improvements of the main tributaries, \$2,500,000 should at once be appropriated, the entire cost, \$16,000,000, would be repaid in one year, and in every year thenceforward forever, in benefits not to the people of a few States only, but to the people of this nation. Such improvements would diminish, by ten cents per bushel, the cost of transporting to consumers, all grain produced west of the Mississippi river, and a large part of the surplus produced in Illinois, and by the permanent and far reaching competition which they would establish, would confer benefits immeasurable upon the producers of Wisconsin, Indiana and Ohio, and all the southern States of the valley. But not to these alone would come this immeasurable gain. The consumers of the eastern and southern States would share the benefits; the workman would find cheaper food upon his table, and his wages virtually increased; the manufac

turer would find a more prosperous body of customers at the West seeking for his goods ; the capitalist would find for his investments a security for which he can never hope as long as the people of sixteen great States are burdened, if not prostrated in their industry by unnecessary cost of transporting their products to a market. Nor can the statesman forget that, in the hour of national peril, it was this great river which bound this people together with irresistible power, and that the revival and development of the natural commerce along its current will do more than all things beside, to obliterate all feelings of separation, and to render us in heart, and in purpose, and in deed, forever one nation.

To this most truly national object, we pray that the Congress of the United States will give its early attention, and your petitioners will ever pray.

WEB. M. SAMUEL, Chairman,
 R. P. TANSEY,
 GERARD B. ALLEN,
 HENRY C. HAARSTICK,
 WM. H. SCUDDER,
 THOMAS ALLEN,
 ISAAC M. MASON,
 GEORGE BAIN,
 JOHN M. GILKESON,
 CHAS. H. TEICHMANN,
 WM. M. GROSVENOR, Secretary.

UNION MERCHANTS' EXCHANGE,

Secretary's Office,

ST. LOUIS, Jan. 12, 1874.

At a regular meeting of the Board of Directors of this Association, held this day, the foregoing memorial was unanimously approved, and the committee were instructed to submit the same to the Congress of the United States:

GEO. H. MORGAN,

Secretary.



ST. LOUIS, January 2, 1874.

WEB. M. SAMUEL,

Chairman Com. on Improvement of the Mississippi River:

Since my appointment as Secretary of your Committee (November 13) the time has been quite too short for such an examination and presentation of the facts bearing upon the problem of transportation, and the necessity of the improvement of the Mississippi and its tributaries, as I should have wished to make. The subject deserves rather six years than six weeks of especial attention.

But the accompanying appendices, which examine each a separate phase of the subject, present facts of much importance, and may, perhaps, be appropriately printed with the Memorial of the Committee. They discuss:

APPENDIX A—QUANTITIES NEEDING TRANSPORTATION.

- “ B—LOCATION OF SURPLUS PRODUCTS OF THE VALLEY.
- “ C—THE ROUTE BY LAKE AND CANAL.
- “ D—RAILROADS, PRESENT AND POSSIBLE.
- “ E—PROPOSED ARTIFICIAL ROUTES BY WATER.
- “ F—THE MONTREAL ROUTE, AND ITS ADVANTAGES.
- “ G—THE NATURAL SUPERIORITY OF THE ROUTE BY RIVER IN
CHEAPNESS.
- “ H—ITS PECULIAR ADAPTATION TO THE LOCATION OF SUR-
PLUS PRODUCTS.
- “ I—SUPPOSED CLIMATIC INFLUENCES.
- “ K—THE BAR AT THE MOUTH OF THE RIVER.
- “ L—THE OBSTRUCTIONS IN THE CHANNEL OF THE MISSISSIPPI
AND ITS MAIN TRIBUTARIES.

These papers are at the service of the Committee, if it is thought proper to publish them.

Very respectfully, your obedient servant,

W. M. GROSVENOR,

Secretary.

APPENDIX A.

QUANTITIES NEEDING TRANSPORTATION.

It will not be denied that existing facilities for transportation of the surplus products of the Mississippi Valley are inadequate; that their inadequacy causes high rates, imposes heavy burdens alike upon producers and consumers, checks agricultural production, and embarrasses all productive industry, and has already contributed to cause grave financial, commercial and industrial disasters. But if those facilities are already inadequate, the statesman will realize the necessity of providing for the far greater needs, in the immediate future, of a population which increased fifty-two per cent. in the decade before the war, and in spite of four years of sanguinary contest nevertheless increased about thirty per cent. during the decade ending in 1870.

Agriculture has been, and at least for generations to come must be, the predominant industry of this Valley. Without the enormous surplus there produced of food and of material for clothing, the magnificent development of manufacturing industry in the eastern States would have been impossible. To supply the increasing demands of an industry thus developing, the surplus of agricultural products at the West must increase, and, to that end, new lands must be cultivated, and the cost of the exchange of products must be materially reduced.

The deficiency of existing facilities for transportation, and the present cost of exchange of products have been most severely felt by the farmers of the north-western States. Their products are so bulky in proportion to value, that a small change in the cost of reaching a market often takes the entire profit, or even more, from the price at which they can be sold. The products of the southern States, ranging in value from seven to twenty dollars per 100 lbs., will bear a much longer or more costly transportation than the products of the north-western States, of which (excepting wool,) the value even at eastern seaports varies from less than one to about three dollars per 100 lbs. Moreover, the whole crop of cotton weighs about one million tons, while a large crop of corn weighs twenty-eight million tons. It is by the enormous bulk and weight of north-western agricultural products that the routes of transportation are overcrowded. The difficulty, it is important to observe,

is in the eastward movement; the freight moving in that direction is, in tonnage, at least three times as great as the westward freight, and this difference, in greater or less degree, must always exist in the exchange of food and raw materials for manufactured or imported goods, by whatever route that exchange may be effected. The facilities which suffice for the movement of food will always more than suffice for the movement of whatever that food may purchase, and a cost of transportation which makes it possible to move wheat and corn, can never greatly impede or burden the return of manufactured products far more valuable in proportion to their weight or bulk. Moreover, no other great industry now suffers because a material part of its products remains unsold in consequence of the cost of moving them to the consumers. Thus any measure which provides for the movement of the agricultural products of the north-west, which form more than half of the eastward freight, will meet all difficulties and solve the problem of transportation.

What products, and what quantities of each, require transportation from the interior to consumers in the seaboard and Southern States, or in foreign countries?

It is generally supposed that the trade reports of shipments from and receipts at different cities give to this question an answer sufficiently correct. Not many years ago, such reports did show nearly the whole movement of the more important articles. But with the multiplication of railways, and the organization of companies for the transportation of through freight, the character of the movement has greatly changed. From the chief western cities, a much larger proportion of shipments is now sent to the manufacturing towns, to millers, or to other consumers at the East, without passing through the chief cities in which trade reports are preserved. On the other hand, the chief western cities also handle a much smaller proportion of the entire quantity transported, and the shipments from a multitude of smaller western towns, from millers in the country, from buyers at railway stations, and from associations or even from individual farmers, directly to the great eastern markets, have remarkably increased, so that the receipts at six eastern seaports considerably exceed the entire shipments eastward from the eight western cities through which the larger quantities are moved. Finally, the local purchasers and millers, and the shippers in the smaller western towns no longer send entirely to the six eastern seaports, but also forward quantities, in the aggregate no longer inconsiderable, directly to eastern consumers. Thus the record of shipments from chief western cities omits the large quantity sent

from smaller towns to the eastern seaports; the record of receipts at eastern seaports omits the large quantity sent from western cities directly to eastern consumers; and both omit the quantity sent from the smaller western towns directly to the consumers. The quantity actually moved includes a part of the known shipments from the West added to the whole known receipts at the East, or a part of the known receipts added to the whole of the known shipments, and in either case another quantity altogether unknown.

Still more difficult is it to determine the quantities moved from the northwestern States to the southern and southeastern. By far the greater part of this commerce passes over the extensive interior system of navigable waters, but there are also ten railroads running southward from the Ohio, and seven more eastward from the Mississippi below the Ohio junction, including one at New Orleans, and three more southward from the Tennessee at Decatur and Chattanooga; and shipments to the interior of the South may thus be made to either one of twenty points by river and thence by rail, or by river to New Orleans, and thence by the gulf. Of hundreds of points along the Mississippi and Ohio from which shipments southward and south-eastward are made, St. Louis is the only one which keeps any record of the direction of shipments, for the Cincinnati reports class together all shipments "by rail," whether eastward or southward; and of the twenty railroads not one publishes such statistics of its operations as to show what quantities of northwestern products it has moved to the interior of the southern States.

In spite of these grave difficulties, however, results of great importance may be attained by comparing, first, known shipments and receipts with the quantities known to be transported over certain routes; and second, those data with estimates of the surplus of agricultural products available for shipment from the northwest, and of the deficiency in production as compared with consumption at the East and South.

The following table states the quantities of flour and grain known to have been shipped from the cities of Chicago, Milwaukee, St. Louis, Detroit, Toledo, Duluth and Cincinnati, in the year 1872; second, the quantities shown by trade reports to have been shipped from St. Louis, Cincinnati and Chicago to the South; third, the quantities remaining, most of which were shipped eastward, and the tonnage; fourth, the known receipts in the same year at New York, Philadelphia, Baltimore, Boston, Portland and Montreal, with the tonnage:

KNOWN SHIPMENTS OR RECEIPTS LESS THAN KNOWN
TONNAGE.

	Known Shipments.	To the South.	Remain- der.	Tons.	Known Receipts.	Tons.
Flour.....	6,252,147	1,662,633	4,589,514	458,951	8,193,535	819,351
As Wheat.....	31,260,735	8,313,165	22,947,570	.....	40,967,675	.....
Wheat.....	34,922,606	1,300,656	33,621,944	1,002,058	28,187,223	845,596
Total Wheat.....	66,163,335	9,613,821	56,549,514	1,467,009	69,154,898	1,564,947
Corn.....	71,011,138	5,350,371	65,660,767	1,817,381	71,458,823	2,001,687
Oats.....	21,792,113	3,013,869	18,778,244	299,972	22,255,054	356,080
Barley.....	6,228,817	279,948	5,948,869	142,372	5,311,385	127,473
Rye.....	1,305,010	127,435	1,177,575	32,972	724,806	20,294
Total.....	166,500,413	18,155,444	148,044,969	3,779,716	168,934,966	4,170,811

Tonnage of the New York and Welland Canals, and Pennsylvania, Erie and
New York Central Railroads, alone, of vegetable food..... 5,080,467

It appears that the quantity and the tonnage shipped eastward from the chief western cities are much smaller than the receipts at the six seaboard cities, showing that of the quantity there received a larger portion was shipped direct from smaller western towns than was shipped from the chief western cities direct to other eastern towns. But it also appears that the entire receipts at the seaboard cities amounted to only 4,170,481 tons, and of this quantity some portion came from Canada, for in that year we imported thence 5,565,000 bushels of barley—more than was received at all the seaports; thus the quantity of all grain received at eastern seaports (not from Canada) was not more than four million tons. But during the same year the quantity of agricultural products moved on the New York canals was 1,683,962 tons, only 3,903 tons being of products other than vegetable food, and only 81,138 tons of vegetable food other than flour and grain. In the same year the quantity of agricultural products moved by the Welland canal was 625,891 tons. And in that year also the New York Central R. R. moved 1,158,894 tons of vegetable food; the Erie, 711,720 tons, and the Pennsylvania at least 900,000 tons—for in 1871 the quantity was 851,579 tons, and the total tonnage only 6,575,843, but in 1872 the total tonnage had increased to 8,459,535. As the quantity of vegetable food, other than grain, appears, from the Canal report, to be relatively insignificant, it may be concluded that flour and grain formed nearly the whole of the 5,080,467 tons transported by these five routes. Nor are these the only routes by which grain goes eastward. The Baltimore and Ohio does a large grain business, but does not publish complete statements; its through tonnage, 557,609 tons, is known to include 757,842 barrels of flour, and as Baltimore received only 1,170,960 barrels of flour from all quarters, and 482,520 tons of grain, it may be presumed that at least 300,000 tons came through by that road. The

quantity moved by the Philadelphia & Erie is not known, but the receipts at Erie were 82,928 tons. The Ogdensburg & Lake Champlain Road; controlling the Northern Transportation Co., with its twenty-one fine steamers bringing produce from the lakes, must have moved 100,000 tons of grain; over 43,000 tons are known to have been shipped to Ogdensburg from Chicago and Milwaukee alone. And besides all these, there is the Grand Trunk Railway of Canada, whose splendid terminal facilities at Portland, and large deliveries of grain, make it profitable for the Allan Line to run to that port a portion of the year, and the Great Western of Canada,—the two roads should move at least 200,000 tons. Moreover, there are the roads from Cape Vincent and Sackett's Harbor, the New York Oswego & Midland, and the Delaware & Lackawanna, running from Oswego southward, in all moving at least 100,000 tons. These estimates amount, with the known quantities to 5,860,000 tons. Evidently, therefore, the entire eastern movement of grain is largely in excess of the quantities received at the six eastern cities and it is on other accounts certain that it must be. By all these routes, grain is delivered at cities on the way from the lakes to the sea coast in large quantities. To all who are familiar with the trade, it is known that the shipments from the West directly to eastern manufacturing towns, or other points of consumption, have in recent years become very large, and from the known or estimated tonnage of the different routes, it appears that at least one-fourth, and probably one-third of the entire weight of grain moved to consumers of the East reached them, in 1872, without passing through either of the cities where receipts are recorded. Nor was the year 1872 without parallel in this unrecorded movement of crops. On the contrary, in the year preceding, the excess of the quantity actually moved eastward over the quantity known to have been received at eastern seaports was even larger. The following table shows the quantities of flour and grain received in 1871 at the six seaports, with the tonnage, and the tonnage of agricultural food known to have been moved in that year, also over the Erie and the Welland Canals, and the three chief railroads:

RECEIPTS AND TONNAGE IN 1871, COMPARED.

	Flour.	Wheat.	Corn.	Oats.	Barley, includ'g Malt	Rye.
New York.....	3,579,559	26,794,864	26,516,086	12,423,629	3,803,276	1,072,913
Boston.....	1,539,843	492,429	3,814,729	2,416,273	403,869	36,384
Baltimore.....	1,123,048	4,076,017	5,735,921	1,833,409	.....	88,956
Philadelphia.....	950,065	3,901,670	6,60,300	4,103,400	816,200	370,530
Montreal.....	941,680	7,598,920	3,079,513	39,508	4,025	64,264
Portland.....	482,523	263,868	8,063	197,730	52,279	1,100
Total.....	8,616,998	43,527,798	46,416,612	21,014,009	5,079,649	1,634,197

	Tons Received.		Tons Moved.
Flour.....	861,699	New York Canals.....	1,863,868
Wheat.....	1,395,833	Welland ".....	668,076
Corn.....	1,299,665	New York Central R. R.....	1,459,919
Oats.....	376,224	Erie R. R.	745,670
Barley.....	121,911	Pennsylvania R. R.....	851,579
Rye.....	45,756		
Total.....	3,971,088	Total.....	5,589,112

For this year the quantity moved by the Pennsylvania is officially reported. Presuming, as before, that the quantity of vegetable food other than grain was relatively insignificant—on the canals it was less than 81,000 out of 1,863,868 tons—there is in this year an excess of known tonnage over known receipts, of more than 1,500,000 tons, without any allowance for the quantities transported by the Baltimore & Ohio, Grand Trunk and other routes. Making reasonable allowance for that movement, the quantity of vegetable food transported must have been at least 6,400,000 tons, and of grain alone not less than 6,100,000 tons; while the recorded receipts were only 3,971,088 tons. Thus it appears that in 1871, at least one-third of the grain moved eastward reached consumers without passing through either of the seaports where the receipts are recorded. Moreover, in 1871, as well as in 1872, the recorded receipts at the eastern ports were larger than the recorded shipments (not known to be southward) from the chief western cities.

Six million tons of grain, even with present facilities for transportation, actually move eastward. In addition, a quantity, known to be very large, but which, unfortunately, cannot be accurately ascertained from existing records, goes to the southern States. Of more than eighteen million bushels of grain (including flour as wheat), known to have been sent southward in 1872, nearly the whole was from St. Louis alone; 1,519,936 barrels of flour out of 1,662,633, and 5,351,095 bushels of corn, out of 5,390,371. Yet it is well known that large quantities, only reported at Cincinnati as moved "by rail," really go southward, and that from Cairo and many other points shipments by no means inconsiderable are made by river or railroad. In 1872, during January and February, and again during December, navigation from St. Louis southward was unusually interrupted by ice, and that during the very months in which the crops in the great corn-growing region in Illinois begin to move forward, and, denied passage by the lakes, naturally seek a southern market. At this season the movement by rail to Cairo and other river ports, and thence southward, is large, but wholly unrecorded. Governor Smith, of Georgia, in a recently published statement, estimated the deficiency of the southern States in corn alone at fifty million bushels, and facts presently to be stated more than justify his

estimate. But if fifty million bushels of all grain go southward; the quantity actually moved from the northwestern States exceeds seven million five hundred thousand tons. The entire ocean commerce of the United States, including all American and foreign vessels clearing for foreign ports, excepting in Canada, New Brunswick and Nova Scotia, has not enough capacity to move the grain now shipped from the northwestern States.

Consumption of cereals is usually estimated by population alone, and results obtained by that method, when applied to all cereals together, approximate to the actual consumption, and still more closely to the quantities required for consumption in the different States. The census taken July 1st, 1870, shows a production of cereals during the year preceding of 1,467,299,183 bushels. Treasury returns for the year ending June 30th, 1870, show that the equivalent of 56,707,843 bushels was exported, flour being reduced to wheat. Deducting exports, there remain for consumption 1,310,591,340 bushels, or 33.98 bushels *per capita*.

At 34 bushels *per capita*, the six New England States, New York, New Jersey, Pennsylvania, Maryland, and Delaware, with the District of Columbia, would consume 453,434,496 bushels, but their production was only 237,317,165 bushels, or 216,117,331 bushels less than the quantity required for their consumption according to the general average of all the States. The thirteen States south of the Potomac, the Ohio, and the southern border of Missouri would consume 382,513,974 bushels, but they produced only 299,616,877, and their apparent deficiency is 82,897,097 bushels. These enormous deficiencies, and over fifty-six millions more for export, were supplied by the surplus products of the remaining States and Territories, namely, those west of the Alleghanies and north of the Ohio line, including the Pacific States. Calculated upon the same basis, the surplus over the average consumption in this region was 355,812,071 bushels. In Tennessee and Kentucky there was a considerable surplus, but we may conveniently suppose it consumed in partly supplying the greater deficiency in States further south.

The consumption of wheat may properly be estimated upon the basis of population. In 1850 the average was 3.93 bushels *per capita*; in 1860 it was 4.95 bushels *per capita*; and the average consumption for the four years 1869-72 inclusive, was 5.10 bushels *per capita* each year. For a general estimate of the surplus or deficiency, the ratio of four bushels to the person in 1850, and five bushels to the person in 1860 and 1870 will yield general results

sufficiently accurate. At that ratio, the deficiency in the eleven eastern States and the District of Columbia was 24,866,168 bushels, Delaware and Pennsylvania only growing a surplus. In the thirteen southern States the deficiency was 26,185,298 bushels, Virginia and West Virginia only producing a small surplus. The following table, giving for each State the actual production and the consumption upon these ratios, with the surplus or deficit in each case, though by no means corresponding accurately with the facts, serves to show in what direction the surplus wheat and cereals of the north-west must be moved, and to afford some idea of the vast quantity of grain thus demanding transportation :

STATES.	Popula- tion.	Proport'te Wheat at 5 bu.	Consum'n Cereals at 34 bu.	Production 1870.		Surplus or Deficit.	
				Wheat.	Cereals.	Wheat.	Cereals.
Alabama....	996,992	4,984,960	33,897,728	1,055,668	18,828,277	- 3,920,892	- 15,069,451
Arkansas....	484,471	2,422,355	16,472,014	741,736	14,682,450	- 1,600,609	- 1,783,564
Florida.....	187,748	938,740	6,383,432	.....	2,339,817	- 938,740	- 4,043,605
Georgia.....	1,184,109	5,920,545	40,259,706	2,127,017	21,766,668	- 3,793,528	- 18,493,038
Kentucky....	1,321,011	6,605,055	44,914,374	5,728,704	63,700,675	- 879,351	- 18,870,301
Louisiana....	726,915	3,634,575	21,715,110	99,066	7,626,786	- 3,626,669	- 17,088,325
Mississippi..	827,922	4,139,610	28,149,348	274,479	16,346,825	- 3,865,131	- 11,802,523
N. Carolina..	1,071,361	5,356,805	36,426,274	2,859,879	24,909,506	- 2,946,926	- 11,516,774
S. Carolina..	705,006	3,528,030	23,900,104	783,610	9,052,539	- 2,744,420	- 14,938,065
Tennessee...	1,258,520	6,292,600	42,789,680	6,188,916	52,421,685	- 103,681	- 9,632,005
Texas.....	818,570	4,092,805	27,832,186	415,112	21,805,229	- 3,677,783	- 6,027,457
Virginia.....	1,225,63	6,125,815	41,655,542	7,398,787	32,540,244	+ 1,272,972	- 9,115,268
W. Virginia..	442,014	2,210,070	15,028,476	2,483,543	13,506,182	+ 273,473	- 1,522,294
13 States....	11,250,411	56,252,055	382,513,974	30,066,757	299,616,877	- 26,185,298	- 82,897,097
Connecticut..	537,454	2,687,270	18,272,436	38,144	3,187,773	- 2,649,266	- 15,084,663
Delaware....	153,015	625,075	4,250,510	895,477	4,473,625	+ 270,402	+ 223,115
Dist. Colum..	131,700	658,500	4,477,800	3,782	44,033	- 654,718	- 4,433,767
Maine.....	626,915	3,134,575	21,315,110	278,793	4,879,801	- 2,855,782	- 16,435,509
Maryland....	780,889	3,904,470	26,550,306	5,774,503	21,091,234	+ 1,870,038	- 5,456,162
Massachu'tts	1,457,351	7,286,755	49,549,934	34,658	2,660,536	- 7,252,097	- 46,889,368
N. Hampshire	318,390	1,591,500	10,822,400	193,621	2,871,116	- 1,977,879	- 7,951,084
N. Jersey....	906,096	4,530,480	30,807,264	2,090,633	15,903,867	- 2,230,547	- 14,823,397
New York....	4,382,759	21,913,795	149,013,806	12,168,462	77,741,668	- 9,745,333	- 71,272,118
Penn'a.....	3,521,951	17,609,755	119,746,334	19,672,957	97,492,934	- 2,063,222	- 22,253,400
Rhode Isl'd	217,353	1,086,775	7,397,002	784	524,068	- 1,085,681	- 6,864,034
Vermont.....	330,551	1,652,755	11,238,731	454,703	6,362,790	- 1,198,052	- 4,875,944
11 St's & D C	13,136,339	66,681,695	453,434,590	41,815,527	237,317,65	- 24,866,168	- 216,117,331
Other States	13,971,621	69,858,105	474,553,670	215,863,372	830,365,141	+ 146,005,267	+ 355,812,071

This estimate supposes a consumption of wheat somewhat too low in the eastern and too high in the southern States, so that of the actual deficiencies that in the eastern States is the larger. It will also appear that the apparent surplus of cereals in the north-western and Pacific States, enormous as it seems, is not as great as the actual surplus in years of full crops, for in the year 1870 the crop of corn was short about two hundred million bushels, although the consumption also greatly diminished.

Looking first to the production of wheat in the north-western States, and estimating the consumption at the ratios already given, we find an apparent surplus available for shipment to other States,

in 1850, of twenty-two million bushels, in 1860 of forty-nine million bushels, and in 1870 of one hundred and thirty million bushels upon the basis of the census returns as to production. The following table indicates in what States the surplus was produced :

STATE.	1850.		1860.		1870.		SURPLUS in millions & tenths.			
	Crop.	Con. at 4 bu	Crop.	Con. at 5 bu	Crop.	Con. at 5 bu.	'50	'60	'70	'72
Ohio	14,487,351	7,921,316	15,119,047	11,697,555	27,882,159	13,326,300	6.5	3.4	14.5	4.8
Indiana	6,214,453	3,953,654	16,848,227	6,752,140	27,747,222	8,403,185	2.3	10.1	19.3	10.1
Michigan	4,925,339	1,590,616	8,316,368	3,745,565	16,275,773	5,922,295	3.3	4.6	10.3	7.1
Illinois	9,414,575	3,205,880	23,337,023	8,556,755	30,128,405	12,699,455	6.2	15.3	17.4	10.1
Wisconsin	4,286,131	1,221,564	15,657,458	3,879,405	25,066,344	5,273,350	3.	11.8	20.4	16.2
East of river.	39,323,404	17,893,040	79,795,163	34,634,420	127,629,973	45,622,585				
Iowa	1,530,581	768,856	8,449,473	3,374,565	20,435,602	5,958,950	.7	5.1	21.5	14.9
Minnesota	1,401	24,308	2,186,383	860,115	18,866,073	2,198,530	1.3	16.6	20.5	
Missouri	2,981,652	2,728,176	4,227,586	5,910,063	14,315,026	8,566,475	.2	....	5.8	
Nebraska			147,867	144,205	2,125,686	614,965			1.5	1.8
Kansas			194,173	539,030	2,391,198	1,824,935			.5	....
West of river	4,513,634	3,521,340	15,206,022	10,459,395	67,133,975	19,100,925				
Surplus East	21,435,364		45,163,743		82,007,318					
" West	992,294		4,381,047		48,033,050					
	22,427,658		49,544,790		130,040,368					

It is evident that the consumption of Missouri, like that of other formerly slaveholding States, is not as large *per capita* as that of the other States in this group. Four bushels *per capita* seems to be more nearly the consumption of the southern and formerly slaveholding States; instead of wheat they consume more largely of corn, while the eastern States, using less corn than either the southern or western, exceed the average of five bushels in consumption of wheat.

It is not supposed that quantities as large as here stated have actually been transported in the years named. On the contrary, it is evident that a portion of the crop of the northwestern States, not required in those States for consumption, has been at times retained in consequence of insufficient facilities for transportation. The wheat crop of 1869 was an extraordinary one, and from such a crop some surplus would naturally remain for another year, but estimates based upon the moderate crop of 1872, with allowance for increase of population since 1870, still show an available surplus of about eighty million bushels of wheat, and nearly ninety million bushels of wheat (including flour as wheat) have been received during eleven months of the year 1873 at seven seaports.

It is more difficult to make a satisfactory estimate of the consumption of corn than of wheat. Used in part for the food of human beings, in part for the ordinary nutriment of cattle in winter, in part for distilling, and largely in the fattening of hogs and cattle for market, the consumption varies widely in different years, and depends

in different localities upon conditions widely varying. It is evident that no estimate based upon population will answer. Such an estimate would give a surplus of more than three hundred million bushels for the northwestern States from the crop of 1871. In 1850 the consumption of corn averaged twenty-five bushels to each inhabitant, and in 1860 twenty-six bushels, but in 1870 not more than twenty bushels, showing that no reliance can be placed upon estimates on this basis. In fact, though the consumption for human food is quite large in the southern States, in the wheat-growing and hog-producing region of the Northwest it shrinks to so small a proportion of the entire consumption as to be scarcely worthy of consideration in the estimate. Even in Massachusetts, where the cost of wheat flour causes the poorer classes to use corn-meal to some extent as a substitute, it appears, from the statistics of the Labor Bureau, that the consumption in families of laboring persons averaged only 27-4-10 pounds *per capita*, or little more than half a bushel to each person yearly. Yet a consumption of one bushel to the person in the Northwest would amount to only one-fiftieth of the quantity produced. Allowance must be made, however, for the different customs of formerly slaveholding States, Missouri included, in which the lower average consumption of wheat was balanced by a larger use of corn for human food.

The use of corn in distilling is a more important item, and yet does not exceed one-thirtieth of a full crop in the Northwest. The bushel of grain produces fourteen quarts, or three and a half proof gallons of spirits, and the total production of spirits in the United States from all materials other than fruit, during the fiscal year ending June 30th, 1873, was 68,236,567 gallons, so that the consumption of corn for distilling was less than 20,000,000 bushels in all the States, and still less in the northwestern States alone.

In those ten States there are about 17,000,000 hogs, which consume not far from twenty bushels of corn each—much more than half of the entire crop. Moreover, it is a well known fact that the number of hogs in these States increases or decreases very rapidly, and is closely proportioned to the quantity of corn produced. Nevertheless, an estimate of consumption based upon the number of hogs only, does not accord with known facts; it would leave a deficiency not only in four of the northwestern States in 1870, but in Iowa in 1871—a manifest absurdity—and would not yield a surplus corresponding with actual shipments. A large quantity of corn is also consumed in the feeding of cattle for market; nearly 5,000,000 head of cattle are slaughtered every year, and the number thus con-

sumed for food or sent to market, is closely proportioned in each State to the whole number of cattle—milch cows excluded. By far the greater part of the corn crop is thus used in the making of beef and pork, and the number of hogs and cattle increases or decreases so rapidly with the abundance or scarcity of this crop, that the consumption in feeding must of necessity be somewhat proportioned to the entire consumption in the corn and cattle producing States. Comparisons extending over a period of thirty years, and applied to nearly one thousand counties, indicate that this is the fact; that the actual consumption of corn, as indicated by known shipments from different points, is more closely proportioned to the number of hogs and cattle than to any other known basis for estimate, at least in the hog and cattle producing States in the Northwest. Since it is not supposed that the entire consumption is in feeding animals, but only so large a part thereof that the variations in other consumption will not materially affect results, some allowances are necessary, wherever there is reason to believe that a disproportionate quantity is used otherwise than by feeding. Thus, in the southern States, the proportion consumed by human beings is larger, and a somewhat disproportionate consumption may therefore be expected in Missouri. In Ohio four-ninths of all farm animals are sheep, and since corn is used to some extent in fattening or wintering them, an increased consumption may be expected from the disproportionate number of these animals in this as compared with other States. Of the spirits produced by distilling in this country, more than one-fourth is the product of Illinois, and nearly one-half is the product of Illinois and Ohio, and the quantity of corn thus consumed in the two States may be nearly 10,000,000 bushels. But with such modifications, nowhere large as compared with the whole consumption, the ratio suggested approximates closely to the facts in a great proportion of the counties in States from which the surplus of corn is mainly drawn, and it has been here preferred as affording at least a more correct indication than any other, of the quantity of corn required for consumption in different localities and seasons.

The proportion of all corn consumed in the country to the number of hogs and cattle, was nineteen and two-third bushels to each animal in 1870, although the crop of corn in the census year was only 761,000,000 bushels—about 200,000,000 bushels below the average of recent years. The crop of 1871 was 991,898,000 bushels but the number of "other cattle" increased at the same time from 13,566,000 to 15,969,000, and the number of hogs from 25,134,000

to 31,800,000 in February, 1872, and the quantity exported from the crop of 1871, being 30,000,000 bushels, the quantity remaining for consumption was twenty and one-half bushels to each animal. Applying the ratio of twenty bushels per animal to the northwestern States, which produced only 425,022,000 bushels in the census year, there yet remains from that short crop a surplus of 100,000,000 bushels—a much larger quantity than was actually moved. And in 1871, when the ten northwestern States produced 619,157,000 bushels of corn, the surplus available for shipment was 190,000,000 bushels.

Yet recorded shipments or receipts do not show that such quantities have been moved. No reasonable estimate of unknown shipments southward, large as they may be, suffices to account for the disposition of a quantity of corn as large as was evidently available for shipment. Nor does the record of tonnage on eastern routes fully explain the matter. Recorded receipts of corn at the six eastern ports in 1872, were 71,488,000 bushels; adding one-third for shipments eastward which escape record at those points—the eastward movement is only 96,317,000 bushels; and no reasonable estimate of the movement southward, the consumption for human food, the use in distilling, and the disproportionate use in sheep feeding in Ohio, account for the remainder. It is plain, therefore, that the quantity actually available for shipment from the northwest is not now wholly moved. If five bushels of wheat, and thirty-four of cereals to each person, or five bushels of wheat to each person and twenty to each animal, suffice for the average consumption throughout a country in which no considerable part of the population ever suffers for lack of grain or animal food, then a proportion not materially greater would suffice for the food-producing States, and the quantities remaining from their productions could be moved, and but for the cost of transportation, would naturally be moved to supply deficiencies elsewhere in our own country. Moreover, quantities far greater than are now exported would find, but for the same obstacle, a ready market in Europe, and in the West Indies, Central or South America, and our growing indebtedness to foreign nations could thus be materially reduced.

The crop of oats produced in the northwestern States, according to the census report, was 159,000,000 bushels in 1869, and according to the Agricultural report it was 147,000,000 bushels in 1871. Meanwhile the number of horses in these States had increased from 3,615,000 to 4,520,000. Ohio, Indiana, Missouri, Kansas and Nebraska do not produce of oats a quantity sufficient to supply a

consumption proportioned to their number of horses, but in those States, as in others further southward, other food is now largely used. In the other north-western States, the apparent surplus is from 22,000,000 to 32,000,000 bushels, and it has appeared that about twenty-two million bushels were received at Eastern ports. The north-west produced in 1870, only 10,605,000 bushels of barley, and in 1871 only 9,760,000. In view of the imports from Canada, it is clear that of this grain the north-western States have no considerable surplus beyond the quantity actually shipped—from five to six million bushels—for a portion of the recorded shipments from western cities were to other cities at the West. Of rye, also, there is not produced in that section a surplus greater than the small quantity actually moved. The quantity produced in 1870 was 6,470,000 bushels, and in 1871 only 5,746,000 bushels.

Thus it appears that the unknown shipments of grain, which appear neither in the recorded shipments at the West, nor in the recorded receipts at the East, but which swell the tonnage from 4,000,000 tons, the known receipts, to 6,100,000 tons of vegetable food actually moved, must be of wheat and corn, and mainly of corn. A simple reason is suggested by the time at which this crop naturally seeks a market. Harvested in October and November, it is yet unfit for safe handling, nor do the farmers find time to move much of it before the route by lake and canal has closed. For at least five months, until the canals open in May, if they wish to forward any part of their crop they must send it southward, or by rail eastward. Corn thus shipped from the largest corn-growing districts, touches no western city in which crop movements are recorded, and is delivered directly to the miller or stock-feeder at the East, or the planter at the South.

Wheat, on the contrary, is moved largely in the fall, and whether forwarded by rail or not, does not go forward from any considerable wheat-growing district without passing through either Chicago, Milwaukee, St. Louis, Detroit, Toledo, Cincinnati, or Cleveland. Its consumption at the East, moreover, is largely in cities, while corn is largely consumed in feeding cattle for market.

Now the receipts of grain at the seaports amount to 3,971,088 tons in 1871; the actual tonnage of vegetable food moved by five routes to 5,589,112 tons; and the estimated tonnage eastward, other routes included, to 6,100,000 tons of flour and grain. Of barley and rye the quantities received are quite as large as the available surplus at the West; of oats the quantity moved cannot exceed the quantity received more than 10,000,000 bushels, or 160,000 tons; a

remainder of 1,970,000 tons of grain must have been either of wheat or corn, and mainly of corn. The estimated corn crop of the preceding fall was 1,094,000,000 bushels. The shipments eastward, other than to seaports, must have been in that year at least 60,000,000 bushels, or 1,680,000 tons of corn, and nearly 10,000,000 bushels, or 300,000 tons of wheat. Thus the movement eastward, the estimated surplus, and the remainder for shipment to the southward, or for superfluous consumption, may be thus stated :

	Eastward.	Surplus.	South or Unsold.
Wheat	96,500,000	116,000,000	19,500,000
Corn.....	106,000,000	190,000,000	84,000,000
Other Grain....	36,000,000	40,000,000	4,000,000
	<u>238,500,000</u>	<u>346,000,000</u>	<u>107,500,000</u>
In Tons.....	6,100,000	9,300,000	3,200,000

For a year of smaller crops some reduction must be made ; the quantity of grain moved eastward was probably about 5,700,000 tons in 1872, and the entire surplus about 8,600,000, of which 2,900,000 tons were either shipped southward or consumed in excess of the estimated average. As nearly twenty million bushels are known to have gone southward, nearly all from one point, it is not improbable that fifty million bushels in all found a market in that quarter, while nearly as much more appears to have found no market. Absolute accuracy will not be claimed for estimates necessarily based in part upon conjecture. But these serve to show both the magnitude of the exchanges now effected, and the urgency of the demand for increased facilities for transportation.

Thus far, only the movement of grain has been considered. But for an appreciation of the deficiencies of the present routes for transportation it is necessary to observe that from the same prolific valley enormous quantities of animal food are sent forward to Eastern consumers. In the year 1872 about 472,000 tons of hogs and cattle were shipped from Chicago alone, about 120,000 tons from St Louis, and about 60,000 tons from Cincinnati ; 652,000 from three cities only. The average age of beef cattle when sent to market does not exceed three years, and if one-third of the number in the country are consumed each year, the average is 117 to each thousand persons. At that average the number of cattle sent to market each year from the Northwestern States and Texas, in excess of the consumption of those States, is 1,057,742, and as 510,025 head were shipped from Chicago alone in 1872, the number is doubtless much greater than one million. Of hogs also about two million were shipped from Chicago alone, and of sheep 145,000. As only

about one-fourth of the hogs packed at the west were packed at that city, so probably not more than one-fourth of the live hogs shipped eastward passed through it. These data warrant an estimate of at least 1,500,000 tons as the weight of animals moved eastward, and the statements of only four railroads show a movement of 1,558,405 tons, viz., on the New York Central, 785,879; on the Pennsylvania, 395,296; on the Erie, 305,599, and on the Baltimore and Ohio, 72,631 tons.

The quantity of meat packed at the West is closely estimated. In 1872 the hog product at the different packing points in the Mississippi Valley was over 1,100,000,000 lbs., or 550,000 tons. Of about 60,000,000 lbs. of wool produced in the same region, the greater portion goes forward to eastern mills, and a large, though not ascertainable, portion of 170,000,000 lbs. of tobacco produced; besides at least 60,000 tons of spirits (30,000 tons were shipped eastward through a single port), 10,000 tons of flax, 42,000 tons of flax-seed, 10,000 tons of hemp, a surplus of perhaps 22,000 tons of butter, and quantities of cheese, potatoes, fruit, and minor farm products, of which no accurate estimate can be formed. Besides grain, the products of agriculture of which estimate is possible, and of which the greater portion passes over the routes from the Mississippi Valley eastward, already amount to 2,304,000 tons, and there are yet to be added 565,000 bales of cotton which moved northward across the Ohio or Mississippi, and thence eastward by rail, equivalent to 130,600 tons. Of 108,000 hogsheads of sugar grown at the South, probably no portion goes by the interior route. Thus, of agricultural products other than grain, some estimate of which can be formed, 2,434,000 tons seek a market mainly at the East, and it is believed that the proportion of tobacco, wool, flax, and flax-seed and hemp, which is reserved for use at the West, is not in quantity greater than the shipments of potatoes and other vegetables, apples and other fruit, cheese, seeds, peas, and beans, and other products of which no estimate is made. But, upon this supposition, not less than 8,134,000 tons of agricultural products are moved eastward (beside cotton, sugar, and some grain and other products southward), taking 5,700,000 tons as the yearly shipment of grain in that direction. At the same time the remainder of 2,733,000 bales of cotton produced in the Valley, or about 2,168,468 bales and 500,916 tons, find a route to market by way of the Gulf, with a small portion of the grain shipped southward.

To fully measure the task imposed upon existing routes eastward, it must also be remembered that a large quantity of forest

products from the lakes and the western States goes eastward. Over the New York canals in 1872 there were moved 1,671,721 tons, and over the three chief railroads 1,061,341 tons. At the same time an immense quantity of iron ore and pig iron, coming eastward to Pittsburg and other points in the eastern States, crowds the railroads, employs over two hundred vessels on the lakes, and a large fleet on the Ohio river. The quantity shipped from the Lake Superior district in 1871 was 1,250,000 tons, and from St. Louis about 315,000 tons were forwarded. Almost at the very point at which the load of eastward bound iron and ore begins to diminish, the product of petroleum adds about 900,000 tons more to the eastward freight. The annual product is about 1,200,000 tons, of which about three-fourths goes eastward, 462,216 tons were moved over the Pennsylvania road alone, and no less than 768,000 tons were exported to foreign countries during the year 1872. This product, and the enormous shipments of manufactured iron, coal, and raw iron and ore, burden the railroads from that point and occupy a large portion of their carrying capacity. The Pennsylvania road moved 3,669,071 tons of coal in 1872, the Erie 3,450,469 tons, and the Baltimore and Ohio 2,068,683 tons; total by three roads 9,188,223 tons, but these quantities were moved in each case a distance much less than the whole length of the road, and not wholly eastward. But the coal, lumber and petroleum moved by the railroads amounts to 11,186,564 tons. The quantity of manufactured iron moved eastward from Pittsburg and the Ohio iron districts must also be very large, since at least 1,565,000 tons of pig iron or ore are moved to those districts for manufacture; if we suppose only 800,000 tons, we find a total tonnage, mainly of eastward bound products exclusive of the agricultural and moved by railroads alone, of nearly twelve million tons—11,986,564. To this must be added the 1,671,721 tons of lumber which help to block the canals, and 107,000 tons of "other articles," arriving at tide water from western States. Thus the canals and the four chief railroads must move about 13,765,285 tons of other than agricultural freight yearly, excepting coal the whole of it eastward bound, and though it is not by any means all through freight, the movement of a quantity so enormous, taxes heavily and constantly the carrying capacity of these routes. And it is upon these same crowded routes, with little aid from the Grand Trunk and a few smaller roads, that over eight million tons of agricultural products are thrown in years when the crops are as large as they have been in 1871 and 1872. It is surely not strange that rates are sometimes higher, and that large quantities of western products remain unmoved and are wasted.

APPENDIX B.

LOCATION OF SURPLUS PRODUCTS.

It is remarkable that in discussion of questions of transportation so little attention has been given to the location of the freight to be moved. It is customary to consider only the gross products of different sections of States, and to presume that the quantities to be shipped thence to distant markets, are movable alike from every portion of a State, and proportioned to the quantities produced. The error is so grave, and withal so apparent, that its long indulgence is surprising. Ohio, for example, produced in 1872, less wheat than Pennsylvania, yet Pennsylvania had not more than two million bushels to spare, while Ohio had nearly five million bushels for shipment. Illinois produced more wheat than Minnesota, yet Illinois could spare for shipment less than ten million bushels, while Minnesota had for export about twenty million bushels. It is in the last degree important, in the consideration of the question of transportation, to ascertain not only what quantities of products are to be transported, but from what points. If we have coal to move, common sense will construct or improve a route to the coal mines. If we are to transport wheat or corn, the facilities for transportation should be so adapted as to reach the regions in which the surplus of either is produced.

Referring to the table given in Appendix A, page 9, we see at a glance that there has been a remarkable westward movement of the center of the wheat surplus. In 1850, Ohio, Michigan and Indiana produced over twelve million bushels of the surplus, and all the other States only ten million bushels, and the line of equal division was near the middle of Indiana. In 1860, these States produced seventeen million bushels of the surplus, while States west of the Mississippi produced six and a half millions, and Illinois and Wisconsin twenty-seven millions, so that fully half was produced west of a line passing through the eastern half of Illinois. In 1870, States east of Illinois and Wisconsin produced forty-four million bushels of the surplus, and States west of the river, sixty-seven millions, and the line of equal division of surplus passed through the western portion of Illinois and Wisconsin. Of the surplus of 1872,

of which details will presently be given, twenty millions were produced by the three Eastern States, and over thirty-five millions by States west of the Mississippi, so that the dividing line cuts that river at the bend near Fulton. In 1850 the States west of the river produced only four million bushels, with a surplus less than one million. In 1870 they produced, eighty-two millions, with a surplus, allowing a consumption of only four bushels per capita in Missouri, of about fifty million bushels.

Hitherto estimates of the consumption of wheat have been given, based upon population only. It may be objected that these estimates, in which no separate account is taken of the quantity reserved for seed, suppose a consumption less than actually exists in the great wheat-growing States, and consequently yield a surplus in excess of the quantity available for shipment. Lest to any this objection should seem valid, let an estimate be now made in which an ample allowance for seed of one bushel to the acre shall be conceded, and moreover, liberal allowance for the increase of population since the last census. According to the latest Agricultural Report, the number of acres in wheat has not yet exceeded twenty millions; deducting twenty million bushels, besides the quantity exported, from the quantity produced, the average consumption for the last three years is $4\frac{60}{100}$ bushels *per capita*. Allowing for Missouri, for reasons already stated, one bushel less *per capita*, and to that State, Illinois, Wisconsin and Michigan, an increase of fifteen per cent. in population since 1870—one-fourth of a decade to Jan. 1st, 1873—and to other States west of the river an increase of twenty per cent., it will be admitted that the consumption of these States, estimated upon that basis, with addition of one bushel per acre for seed, will considerably exceed the actual consumption, and the resulting surplus will be less than the quantity actually available for shipment from those States. That the westward movement may not seem to be over-stated, let an increase of only ten per cent. in population be allowed for Indiana, and no increase for Ohio. Its gain in population during the last decade would warrant an estimated increase of at least five per cent., and thus reduce the estimated surplus of that State by 660,000 bushels. An estimate upon this basis, it is believed, can err only in placing the supposed consumption of the whole northwest too high, and the surplus too low, and in giving to the eastern States of that section too large, and to the western too small, a proportion of that surplus. But upon this basis the production, consumption and surplus available for shipment from the several States in 1872 and 1873, are presented in the accompanying tables:

WHEAT SURPLUS—MINIMUM ESTIMATE.

STATE.	Crop of 1872.	Population.	Pr ct. Inter	Wheat Eaten.	For Seed.	Total Consum'd	Surplus.
Ohio	18,203,000	2,665,260	.....	12,260,106	1,387,588	13,647,877	4,555,123
Indiana	19,381,000	1,848,700	10	8,504,020	1,830,363	10,346,383	9,046,617
Michigan	13,936,000	1,363,666	15	6,272,804	1,092,000	7,364,804	6,571,136
Illinois	24,711,000	2,920,874	15	13,436,021	2,559,583	15,995,604	8,715,396
Wisconsin	22,307,000	1,212,870	15	5,579,202	1,523,731	7,107,933	15,199,067
Total	98,538,000	10,011,370	.....	46,052,303	8,404,358	54,456,661	44,081,339
Minnesota	23,200,000	527,647	20	2,427,176	1,054,078	3,481,254	19,718,746
Iowa	22,080,000	1,430,150	20	6,578,630	1,635,600	8,214,230	13,865,710
Missouri	7,695,000	1,979,488	15	7,126,157	519,230	7,645,387	49,613
Kansas	2,155,000	437,278	20	2,011,479	156,200	2,167,679	* — 12,679
Nebraska	2,500,000	147,591	20	678,919	128,333	807,252	1,752,748
Total	57,690,000	4,522,154	.....	18,522,421	3,493,141	22,315,862	35,347,138

*Deficiency.

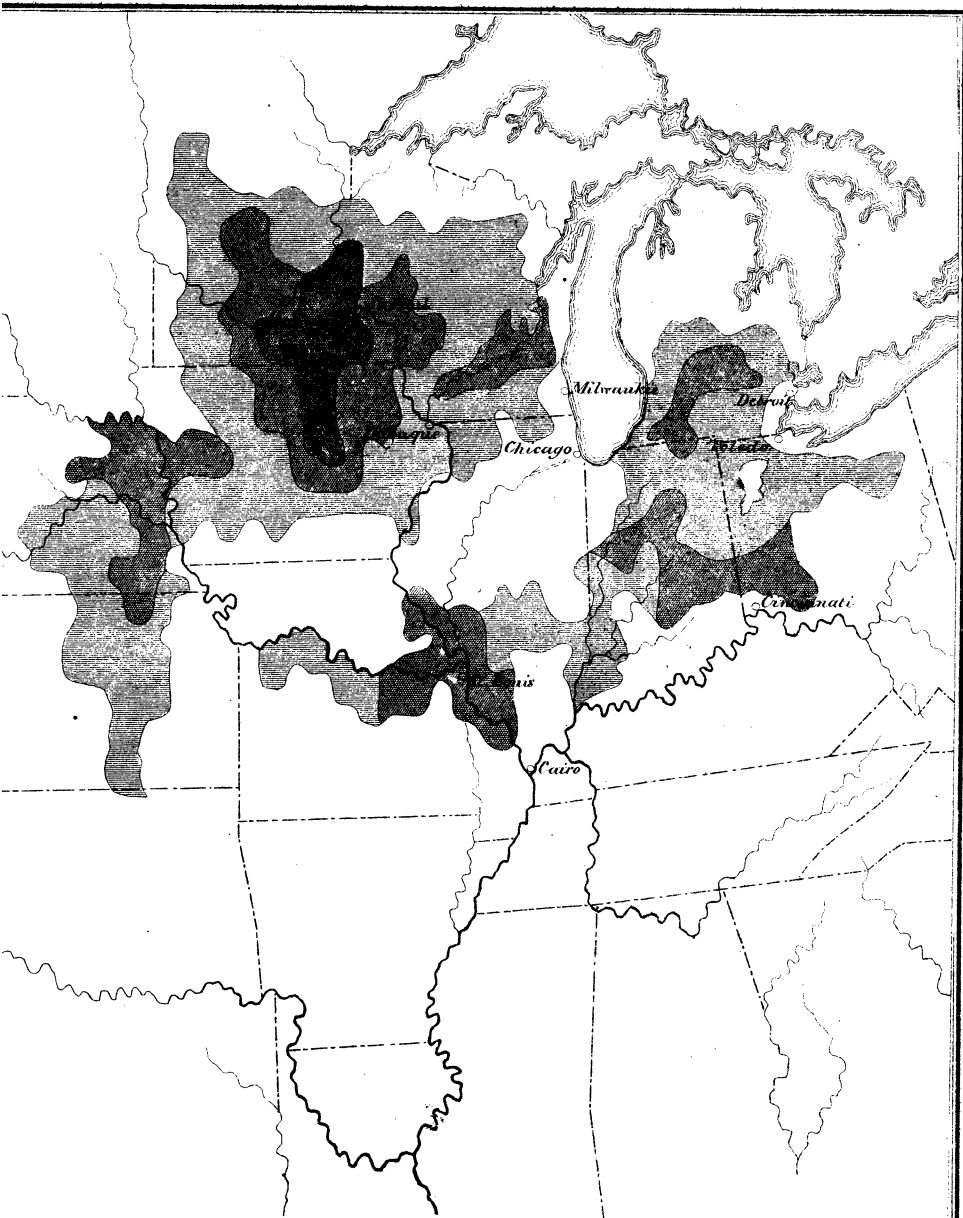
STATES.	1872.		1873.		1850	1860	1870	1872	1873
	Crop.	Surplus.	Crop.	Surplus.					
Ohio	18,203,000	4,555,123	18,467,060	4,919,183	6.5	3.4	14.5	4.5	4.9
Indiana	19,381,000	9,046,617	17,055,280	6,714,897	2.3	10.1	19.3	9.0	6.7
Michigan	13,936,000	6,571,136	11,427,520	4,062,656	3.3	4.6	10.3	6.6	4.1
Illinois	24,711,000	8,715,396	26,93,660	10,198,066	6.2	15.3	17.4	8.7	10.2
Wisconsin	22,307,000	15,199,067	26,232,260	19,214,327	3.	11.8	20.4	15.2	19.2
Eastern States	98,538,000	44,081,339	99,565,780	45,109,199	21.3	45.2	81.9	44.0	45.1
Minnesota	23,200,000	19,718,746	27,840,000	24,358,746		1.3	16.6	19.7	24.3
Iowa	22,080,000	13,865,710	24,720,600	16,515,310	7	5.1	23.5	13.9	16.5
Missouri	7,695,000	49,613	11,465,550	3,820,163	2	....	5.8	....	3.8
Kansas	2,155,000	....	2,995,450	827.77	....	....	1.5	....	....
Nebraska	2,500,000	1,752,748	3,072,000	2,204,748	....	....	5	1.7	2.3
Western States	57,690,000	25,374,138	70,102,600	47,786,738	9	6.4	47.9	25.3	47.7
Total	157,218,900	79,455,477	169,668,380	92,895,857					

Comparative statement for 1850-1873 in millions of bushels and decimals.

The recorded receipts at the chief eastern cities, and at New Orleans, prove beyond question that these estimates are too low, for the quantity of wheat (flour included) received from August 23, 1872, to August 23, 1873, was over eighty million bushels, and it has already been shown that about one-third of the quantity transported eastward does not reach the eastern seaports, so that the surplus from the crop of 1872 must have exceeded one hundred million bushels, and the actual surplus from the crop of 1873 must be nearly 120,000,000 bushels. But even from estimates thus clearly within the truth, it appears that ten Northwestern States have for transportation to consumers elsewhere, eighty million bushels, or 2,400,000 tons of wheat from a short crop, and ninety-three million bushels, or 2,800,000 tons of wheat from such a crop as has been this year produced. Moreover, from an estimate which can only err in attributing to the western portion of that region a smaller part of the surplus than it actually supplies, it appears that nearly half of that surplus came from States west of the Mississippi River even in the year 1872, when the wheat of Missouri and Kansas was well-

nigh a total failure, while in 1873 more than half of the entire surplus is unquestionably produced by States west of the river. The importance of this fact in relation to the question of transportation can not be over-estimated. Fifty million bushels of wheat, or one million five hundred thousand tons, will, during this very year, either force a way southward by a route seriously obstructed, or will cross the Mississippi river in search of a market, and will pay at the least ten cents per bushel, or \$3.33 per ton, for transportation from the river to the lakes. In other words, the people of five States will pay this year five millions of dollars in tribute to artificial routes, because the great river, which is their natural outlet, and the nation's free highway, has not yet received adequate care from the nation's Government.

In the census report of 1870, are certain valuable crop maps, based in part upon actual production and in part upon ascertained productiveness of different areas. Three years ago the map of wheat would have seemed inaccurate. But the production of this very year has remarkably verified the calculations upon which it was based, and it is here reproduced as showing more forcibly than any array of figures, the localities from which the surplus of wheat is actually derived. The darkest shade represents the region of greatest fertility; the medium shade other tracts which, though less productive, still yield a considerable surplus; and the lighter shade covers all other counties which, from the data furnished by the census, appear capable of supplying any surplus for shipment. The natural outlet for the products of each of these wheat-producing tracts will at once appear. The dark cross, extending through Minnesota, central Iowa and northwestern Wisconsin, with the district of medium shade around it, produces about forty-five million bushels, of which the natural outlet is by the Mississippi at St. Paul, Winona, Dubuque, or other points, and nearly all of it should pay ten cents more to reach the lakes than to reach the river. The region of medium shade in Iowa and Nebraska lies along the Missouri River, and produces a surplus of about three million bushels, which must first cross the Missouri, and then the Mississippi, paying (from Omaha) 35 cents per 100 pounds to reach the lakes. The region of medium shade about the confluence of the Mississippi, Missouri and Illinois Rivers, produces a surplus in Missouri of nearly four million, and in Illinois of at least seven million bushels. And even in Ohio and Indiana the river lies close to the surplus producing region, while the Wisconsin river penetrates another tract of even greater productiveness. It would seem that Providence had



LOCALITIES FROM WHICH THE SURPLUS OF WHEAT IS MOVED.

SURPLUS.

Minnesota	24,358,746	Wisconsin.....	19,214,327
Iowa.....	16,515,310	Illinois.....	10,198,056
Missouri.....	3,820,163	Indiana.....	6,714,897
Nebraska.....	2,264,748	Ohio.....	4,989,183
Kansas.....	827,771	Michigan.....	4,062,656
West of river....	47,786,738	East of river....	45,109,119

with deliberate purpose and beneficent care so traced the channels of the navigable streams of the valley as to afford the cheapest possible outlet for the products of all these regions of marked fertility.

If records of the production by counties were accessible, for any year since the census was taken, they would doubtless show a great enlargement of the tracts of especial productiveness in the States west of the river, and in western Wisconsin and Illinois. But even the county returns of 1860 suffice to prove that the surplus which crosses the Mississippi is by no means the only portion of the wheat crop which ought to find a cheaper route by the natural water channels than any now afforded. The following table will suffice to show the surplus or deficit of wheat in each county of Wisconsin, calculated from the crop of 1869, and population of 1870, the figures representing thousands of bushels:

WISCONSIN SURPLUS OF WHEAT.

MISSISSIPPI SECTION.			LAKE SECTION.		
	SURPLUS.	DEFICIT.		SURPLUS.	DEFICIT.
Grant.....	720	—	Kenosha.....	149	—
Crawford.....	126	—	Racine.....	206	—
Richland.....	112	—	Walworth.....	474	—
Vernon.....	458	—	Jefferson.....	508	—
Monroe.....	308	—	Waukesha.....	510	—
LaCrosse.....	380	—	Milwaukee.....	—	212
Jackson.....	172	—	Ozaukee.....	240	—
Trempeleau.....	462	—	Washington.....	596	—
Buffalo.....	567	—	Dodge.....	2055	—
Pepin.....	75	—	Sheboygan.....	447	—
Pierce.....	281	—	Fond du Lac.....	1384	—
Clark.....	—	5	Manitowoc.....	351	—
Eau Claire.....	155	—	Calumet.....	279	—
Dunn.....	100	—	Winnebago.....	560	—
St. Croix.....	768	—	Keweenaw.....	70	—
Chippewa.....	90	—	Brown.....	40	—
Barron.....	—	1	Ontario.....	161	—
Polk.....	23	—	Waupaca.....	118	—
Burnet.....	—	1	Shawano.....	12	—
Douglas.....	—	6	Dodge.....	10	—
Ashland.....	—	1	Oconto.....	—	19
Bayfield.....	—	2			
24 counties.....	4947	16	21 counties.....	8170	231
Net surplus.....	4931		Net surplus.....	7939	

CENTRAL SECTION.

	SURPLUS.	DEFICIT.		SURPLUS.	DEFICIT.
Lafayette.....	403	—	Marquette.....	104	—
Iowa.....	635	—	Green Lake.....	548	—
Green.....	423	—	Waushara.....	150	—
Rock.....	670	—	Wood.....	—	12
Dane.....	2275	—	Portage.....	160	—
Columbia.....	1373	—	Marathon.....	5	—
Sauk.....	368	—			
Juneau.....	131	—	15 counties.....	7266	12
Adams.....	93	—	Net surplus.....	7254	

From this table it appears that even in 1870, about 5,000,000 bushels of the surplus of wheat from Wisconsin was produced in the counties of the Mississippi river section. The crop of 1873 is about

as large as that of 1869, but it is a well known fact that the most rapid increase of settlement and production has been in the western portion of the State. But with reference to routes for the transportation of this surplus, the table shows that as for States, so for counties of extraordinary fertility, providence seems to have provided with especial care channels for transportation by water. Of the two counties, producing a surplus of 2,000,000 bushels each, Dane, with 2,275,000 bushels, is drained by the Wisconsin, and Dodge, with 2,055,000 bushels, by the Fox river; of the two counties, producing a surplus of over 1,000,000 bushels, Columbia, with 1,373,000 bushels, embraces the head of navigation on the Wisconsin, and Fond du Lac, with 1,384,000 bushels, the head of navigation by the Fox and Winnebago; while the two counties producing a surplus of over 700,000 bushels, Grant and St. Croix, both rest upon the Mississippi itself; Lafayette and Greene, on the Illinois line, producing 826,000 bushels, are nearer Dunleith than any other point of shipment, and the counties to which the Wisconsin River would afford, with reasonable improvements, a natural outlet southward, namely, Iowa, Sauk, Dane, Columbia, Juneau and Adams, produced in 1870, a surplus of 7,875,000 bushels, so that with the Mississippi section, counties to which the waters flowing southward afford a natural outlet, produced in 1870, a surplus of 10,632,000 bushels, and all other counties, 9,492,000 bushels. Of the surplus of 19,211,327 bushels in 1873, the greater increase of production in western counties will certainly warrant the supposition that at least 10,632,000 bushels were produced in the same western counties. Without encumbering this page with the details, it may be added that the north and south line, equally dividing the entire surplus of wheat produced in the northwestern States passed, in 1872, near Dunleith, and a little west of the boundary of the Mississippi section, as defined in the table. But in 1873, more than half of the surplus was produced west of the river.

The diagram already given indicates, and the following table of estimated surplus and deficiency by counties shows, that the entire surplus in Illinois is produced within a comparatively narrow tract. The table is calculated from the census returns of the crops by counties, with a reduction in the quantity produced proportioned to the loss in the crop of the whole State—from 30,128,415 bushels in 1870 to 26,193,664 bushels in 1873, with an allowance for quantity reserved for seed, and with a proportionate increase of population in each county, and therefore does not take into account the variations from the general average in decrease of crops or increase of

population, but nevertheless serves to show clearly in what part of the State the surplus of wheat is produced.

ILLINOIS SURPLUS OF WHEAT.

In Thousands of Bushels.

MISSISSIPPI COUNTIES.

Jo Davies	26	McDonough	108
Carroll	236	Schuyler	81
Rock Island	26	Adams	456
Mercer	136	Brown	36
Warren	23	Pike	681
Henderson	114	Calhoun	141
Hancock	131		
			<u>2,198</u>

CENTRAL COUNTIES.

Morgan	140	Bond	220
Scott	152	Clinton	396
Greene	346	Washington	442
Jersey	361	Perry	202
Macoupin	501	Jackson	149
Montgomery	451	Union	54
Christian	402	Randolph	705
Shelby	228	Monroe	446
Effingham	67	St. Clair	962
Fayette	166	Madison	726
Marion	26		
			<u>7,142</u>

WABASH COUNTIES.

Crawford	91	Edwards	55
Richland	47	Wabash	111
Lawrence	141	White	54
			<u>459</u>

CENTRAL BELT, NO SURPLUS. (IN THOUSANDS OF BUSHEL.)

	<i>Surplus.</i>		<i>Deficit.</i>
Lake	15	DuPage	10
Kendall	3	Kane	73
Woodford	124	Will	8
Stark	39	Lasalle	107
Knox	5	Putnam	12
Fulton	118	Marshall	10
Tazewell	4	Grundy	68
Mason	70	Kankakee	57
Cass	46	Iroquois	56
Menard	18	Ford	18
Logan	61	Peoria	174
Sangamon	9	McLean	122
Dewitt	9	Livingston	66
Macon	56	Piatt	10
Vermillion	65	Champaign	8
Moultrie	110	Douglas	19
Edgar	88	Coles	14
Clark	49	Cumberland	2
Jasper	5	Clay	20
Wayne	17	Jefferson	22
Franklin	19	Saline	4
Hamilton	3	Hardin	3
Gallatin	4	Pope	9
Williamson	37	Pulaski	14
Massac	3	Alexander	27
Johnson	8		
		25 Counties	<u>973</u>
26 Counties	<u>967</u>	Cook	<u>1,891</u>

Net deficiency, 52 Counties, 1,897,000 bushels.

REQUIRED TO SUPPLY THIS DEFICIENCY.

McHenry	186	Bureau	188
Winnebago	159	Henry	166
Boone	117	Whitesides	210
Stephenson	248		
DeKalb	185		<u>1,914</u>
Ogle	243		<u>1,891</u>
Lee	212		

Surplus..... 23

Study of any map will show the limits and large extent of the region in which no surplus is produced; the tract whose surplus corresponds to the consumption of Chicago, in excess of the production of Cook County, and will illustrate the complete dependence of the great wheat-producing region of the State upon the natural lines of communication by water. In 1872 the central line equally dividing the wheat surplus of the Northwest passed through Illinois, near and parallel with the eastern border of Adams and Hancock Counties on the Mississippi, while in 1873 the greater part of that surplus was produced in States west of the Mississippi. Moreover, nearly the whole of the surplus produced in Illinois, if moved eastward by lake, must pay about ten cents per bushel for transportation to Chicago, or rail rates to Toledo, while the entire quantity is produced in either counties, along the Mississippi and Wabash rivers, or so located that the route southward by river is the one naturally more easy of access.

The general map (p. 20) sufficiently indicates the location of the surplus of wheat in Ohio. A very large proportion of it is produced in the extreme southwestern corner of the State, in counties from which transportation to the river at Cincinnati is much cheaper than to the lake at Toledo. The accompanying tables, calculated for the year 1872—when the crop was 18,200,000 and the estimated surplus 4,555,123 bushels, whereas in 1873 the crop was 18,667,060, and the estimated surplus 4,919,183, without any allowance for increase of population since 1870—suffice to indicate the counties from which the actual surplus is almost wholly drawn.

OHIO WHEAT.

In Thousands of Bushels.

SOUTHWEST.		NORTHWEST.	
	SURPLUS.		SURPLUS.
Mercer	13	Williams	102
Auglaize	8	Fulton	77
Shelby	227	Defiance	86
Logan	248	Henry	74
Union	46	Wood	49
Darke	367	Sandusky	194
Miami	409	Van Wirt	19
Champaign	368	Putnam	73
Preble	353	Allen	92
Montgomery	230	Hancock	224
Clarke	240	Hardin	77
Greene	290	Huron	459
Butler	224	Wyandotte	107
Warren	152	Crawford	169
Clinton	111	Marion	117
Highland	132	Morrow	46
Ross	34		
Fayette	22	16 Counties	2,025
Pickaway	183	Deduct Lucas	151
		“ Paulding	5
		“ Ottawa	9
10 counties	3,856		
Deduct Hamilton	1,184		
Net surplus	2,672	Net surplus	1,865
Surplus of 39 counties			4,532,000 bushels.
Surplus of remaining 49 counties			23,123
Total surplus			4,555,123

The few counties of the darkly shaded section, not only near Cincinnati, but traversed by the Miami canal, supply a surplus of 3,856,000 bushels, of which Hamilton is supposed to consume 1,184,000 bushels, leaving 2,672,000, or more than half the surplus of the whole State, to be forwarded from this small section. On the other hand, the sixteen counties of the lighter shade in the northwest yield a surplus of 2,025,000 bushels, of which deficiencies in Paulding, Lucas and Ottawa consume 165,000, so that the net surplus in that section is 1,860,000 bushels, and, the entire remaining surplus, as estimated, being only 23,123 bushels, the surplus in the other counties of the lighter shade is, with that exception, consumed in supplying deficiencies. Thus out of a surplus of 4,500,000 bushels, 2,662,000 comes from the few southwestern counties. Thus improvements of navigation would largely benefit the producers of Ohio, if in no other way, by giving them a choice of markets and routes.

The wheat crop of Indiana has decreased remarkably. In 1870 it was 27,747,000 bushels; in 1872 only 19,381,000, and in 1873 only 17,055,280 bushels. In the absence of statistics of the present production by counties, the loss being so great, an estimate based upon a supposed proportionate decrease throughout the State, is the best practicable one, and yet has only a limited value. Such an estimate based upon the crop of 1872, showing the surplus available for shipment from each county if the decrease in production in each county was proportioned to the reduction in the State, serves to show that over one-fifth of the entire surplus has a natural outlet by way of the Wabash and the canal, while a portion still larger, produced in the southeastern corner of the State, may share the benefit of any improvements which facilitate the movement of the crops from the Miami valley in Ohio. If the surplus in 1873 was produced by the different sections in like proportion, the quantities nearer to the river or the lake in cost of transportation were, for the river, about 2,964,897 bushels, and for the lake about 3,760,000 bushels. The surplus of Michigan will, of course, find its cheapest route by lake. The distribution of the wheat surplus of 1873 will then be as follows:

NEARER TO THE RIVER.

All west of the river.....	47,787,788
Illinois.....	16,158,950
Western Wisconsin.....	10,642,300
Southern Indiana.....	2,964,897
Southern Ohio.....	2,974,000

74,253,571

NEARER TO THE LAKES.

Eastern Wisconsin.....	8,587,327
Michigan.....	4,162,600
Northern Indiana.....	3,756,000
Northern Ohio.....	2,247,855

18,642,166

No reasonable modification of these estimates can affect the general conclusion which they justify. Almost eighty per cent. of the present surplus of wheat (that from California excepted) comes from regions to which the Mississippi River and its navigable tributaries furnish the only natural outlet. More than 2,227,000 tons of wheat will this year be moved to consumers at a cost of transportation much greater than is necessary. For all grain west of the river and from Illinois, the difference in cost of transportation is about ten cents per bushel; for the quantities moved from Wisconsin, Indiana and Ohio, the advantages to be gained by improvement of the river route, are equivalent to at least five cents; so that during this one year, either the producers or the consumers of wheat must pay an unnecessary tax of six millions six hundred thousand dollars, because the great channels which nature has traced for the movement of this product have been so long neglected. Is it strange that those upon whom this burden chiefly falls, those who produce eighty per cent. of the wheat transported to the East or the South, and whose sturdy industry will enable them to supply almost any inconceivable increase of demand in the future, pray the government which they support, that the natural channels of communication, the shortest and cheapest routes to the seaboard, shall no longer remain practically closed against the products of their industry.

It has already been explained that the consumption of corn in the great corn-growing states of the Northwest seems to be more closely proportioned to the number of hogs and cattle than to any other basis for estimate. Even with this basis, however, estimates must be regarded as useful rather to give an approximate idea of the relative proportion of the surplus available for shipment from different localities, than as a accurately defining its quantity in any State or county. It is especially difficult of application because the number of hogs changes so rapidly, and the number shown by the census, being that which was reported on the farms in midsummer 1870, differs widely from the number wintered or fattened upon the census crop of corn—that of 1869. The estimates of the Agricultural Bureau are therefore preferred as to hogs, since they give the number in each State on the first of February. The following comparison of the consumption in each State estimated at twenty bushels to each hog and horned animal (milch cows excepted,) with the reported corn crop in 1870 and 1871 (Bureau reports for 1872 not having been published), will at least serve to indicate clearly from what States the surplus of corn is chiefly derived, and give an approximate idea of its quantity. Estimates at the same ratio from

the census returns of 1850 and 1860 are added. The figures in the latter table are millions of bushels and decimals :

STATE.	HOGS & CATTLE Feb. 1st, 1870.	CONSUMPTION @ 20 Bushels.	CROP OF 1869.	SURPLUS.	HOGS & CATTLE Feb. 1st, 1872.	CONSUMPTION @ 20 Bushels.	CROP OF 1871.	SURPLUS.
Ohio	2,481,000	49,620,000	67,501,000	17,981,000	3,023,000	60,460,000	89,506,000	29,046,000
Ind ..	2,657,000	53,140,000	51,094,000	none.	3,239,000	64,780,000	79,205,000	14,425,000
Ills ..	3 08 ,000	61,600,000	129,921,000	68,321,000	4,834,000	96,680,000	203,391,000	106,711,000
Mo.	3,055,000	61,000,000	66,034,000	4,914,000	3,207,000	65,940,000	87,390,000	21,450,000
Kan..	766,000	15,320,000	17,025,000	1,705,000	778,000	15,550,000	24,693,000	9,133,000
Neb..	176,000	3,520,000	4,736,000	1,216,000	107,000	3,340,000	7,228,000	3,888,000
Iowa.	3,136,000	62,720,000	68,935,000	6,215,000	4,468,000	8,336,000	99,019,000	9,659,000
Minn.	319 000	6,380,000	4,743,000	none.	454,000	8,080,000	8,152,000	72,000
Wis.	812,000	16,240,000	15,033,000	none.	1,070,000	21,400,000	21,394,000	none.
Mich.	758,000	15,160,000	14,086,000	none.	982,000	19,040,000	16,179,000	none.
				100,372,00				194,384,000

STATES.	1850.			1860.		
	CROP.	CONS.	SURPS.	CROP.	CONS.	SURPS.
Ohio.....	59	39.	20.	73.5	62.	11.5
Indiana.....	53.	45.	8.	71.6	74.	none.
Illinois.....	57.	38.	19.	115.	68.	47.
Missouri.....	36	34.	2.	72.9	60	12.9
Iowa.....	8 6	6.4	2.2	42.4	24	18.4
Wisconsin.....	1.9	3.2	none.	7.5	11.	none.
Michigan.....	5.6	4.	1.6	12.4	12.	none.
Kansas.....				6.1	4.	2.
Nebraska.....				1.5	.8	.7
Minnesota.....				2.9	3	none.
			52.8			92.5

While the general correspondence is sufficiently close to indicate that the estimate of consumption does not vary very widely from the truth, it may be judged somewhat too low in Ohio, as the extraordinary number of sheep wintered in that State (4,928,000 out of 13,632,000 in the ten States,) probably causes a larger consumption of corn than the ratio indicates, and a smaller surplus. On the other hand, a consumption of corn in Missouri somewhat above the average in other States, justifies some reduction of its apparent surplus, and the fact that corn is not used quite as largely for human food, or even for feeding, in the northern tier of States as in the southern, is suggested by the comparison. But the only result essential to this inquiry seems to be clearly established by the comparison, namely, that more than half of the entire surplus of corn, in years of short as well as in years of large yield, comes from the State of Illinois; while the surplus from other States east of the river, is about equal to the surplus from States west of the river. From the short crop of 1869, sixty-eight out of one hundred millions of surplus seems to come from Illinois, fourteen millions from west of the river, and eighteen from Ohio—or with reductions for reasons

mentioned as to Ohio and Missouri, perhaps twelve and fifteen millions respectively. From the large crop of 1871, out of a surplus of one hundred and ninety-four millions, nearly one hundred and seven came from Illinois, forty-four from west of the river, and forty-three from Ohio and Indiana, or with reduction as before, perhaps forty millions each.

Thus, ascertainment of the location of the surplus produced in Illinois will practically determine the location of more than three-fourths of the whole crop, so far as it affects this inquiry. For that purpose, county returns not being given by the Bureau of Agriculture, it is necessary to use the census report of the number of cattle in 1870. According to the census, the number of hogs in Illinois was 2,703,000, whereas, according to the Bureau report of February 1st, it was only 2,005,000, so that estimates based upon the census give an apparent surplus for Illinois of only 54,000,000, but they nevertheless serve equally well to indicate from what part of the State the surplus comes. They show that the region producing a surplus of corn extends from the northwest border of the State, embracing the three counties nearest the river, southward to LaSalle, thence southeastward to and including Champaign, and Vermillion and Edgar counties on the Indiana border, thence southwestward to Mount Vernon, and thence westward to the river. Three tracts remain which produce no considerable surplus, one covering the northeastern corner of the State, one covering the southeastern, and the southern portion below Jefferson county, and one in the fork between the Mississippi and the Illinois rivers. The accompanying diagram shows the general outlines of the surplus-producing region; the manner in which it is traversed by railroad and water-routes, and the line of equidistance in cost of transportation by each route to the lake at Chicago, or the river at St. Louis. The tables which follow give the number of cattle and hogs and the corn crop, as stated by the census report of 1870, and the estimated surplus upon the short crop of 1869, to which that report refers:

I. Illinois Tract.
II. Iowa Belt.
III. Cairo Tract.

THE CORN SURPLUS.

THE CORN SURPLUS.

- A. Proposed Atlantic and Great Western Canal.**
- B. Proposed James River and Kanawha.**
- C. Illinois Canal.**
- D. Prairie du Chien Canal.**
- E. Proposed Michigan Canal.**
- F. Welland Enlargement.**
- G. Proposed Georgian Bay and Toronto Canal.**
- H. Proposed Caughnawaga Canal.**
- I. Proposed Fort St. Philip Canal.**

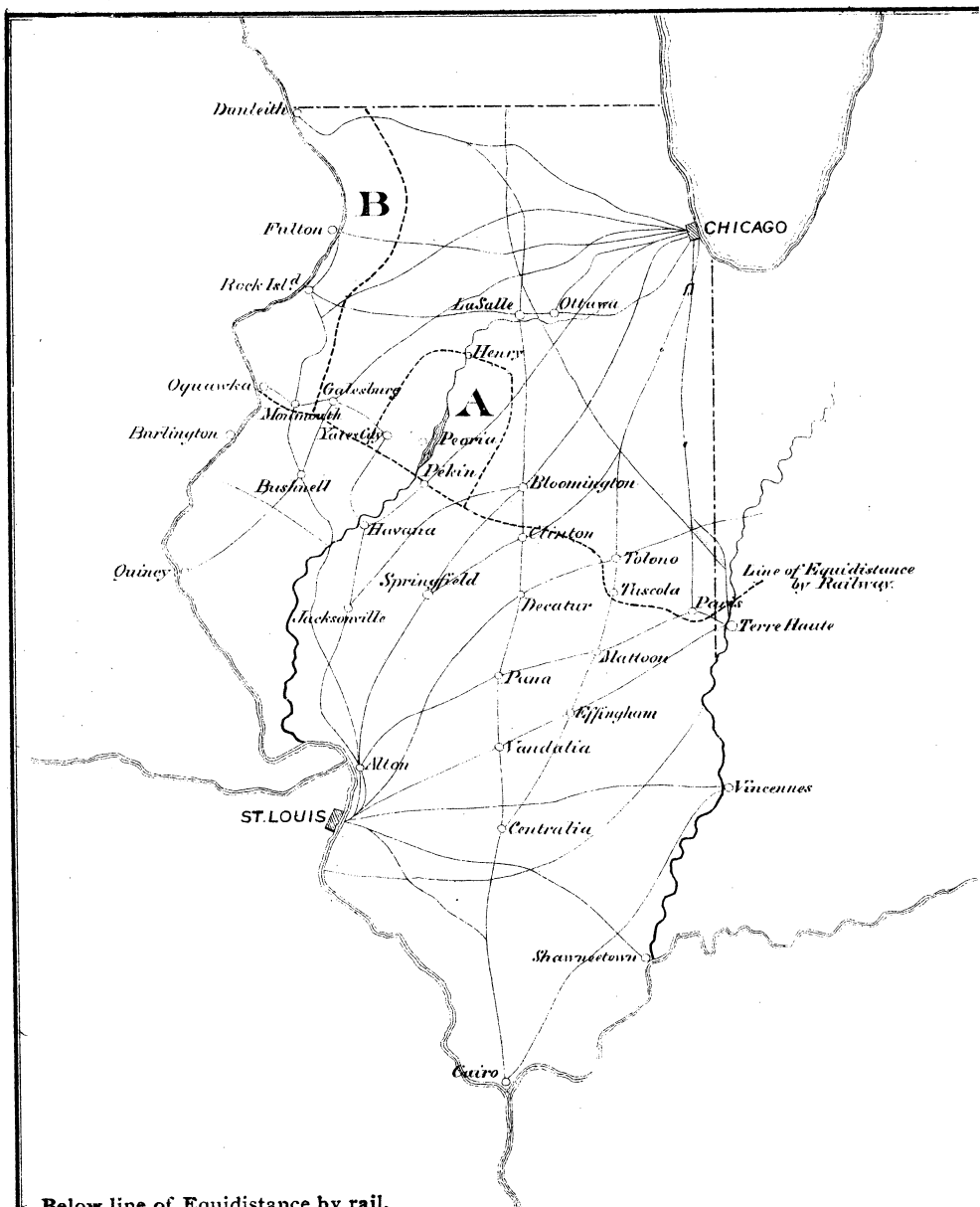
The R. P. Studley Co. lith. St. Louis.

COUNTIES.	CATTLE.	HOGS.	CONSUMPTION	CROPS.	SURPLUS.
			at 20. In Thousands.	In Thousands.	In Thousands.
Adams.....	16,875	56,442	1,460	1,452	.....—8
Alexander.....	783	4,936	114	244	130
Bond.....	4,797	16,007	434	1,004	630
Boone.....	7,956	7,849	316	456	150
Brown.....	4,864	16,208	420	337	.....—83
Bureau.....	28,959	50,574	1,593	3,030	1,438
Calhoun.....	2,718	11,009	274	234	.....—40
Carroll.....	14,613	26,213	816	1,397	551
Cass.....	6,198	12,685	376	1,146	770
Champaign.....	18,516	36,384	1,100	3,924	2,824
Christian.....	7,991	35,015	860	1,883	1,023
Clark.....	7,134	18,771	518	614	96
Clay.....	6,555	20,109	532	1,019	487
Clinton.....	4,114	17,911	440	813	373
Coles.....	11,364	33,619	898	1,133	1,235
Cook.....	14,486	15,521	600	570	.....—10
Crawford.....	4,521	19,819	486	581	95
Cumberland.....	3,645	10,058	374	403	29
DeKalb.....	18,582	26,795	900	1,023	117
DeWitt.....	7,706	29,322	746	1,311	571
Douglas.....	8,070	17,433	522	1,680	1,158
DuPage.....	7,621	9,253	336	332	.....—4
Edgar.....	20,835	38,654	1,190	2,107	917
Edwards.....	22,900	13,274	322	352	30
Effingham.....	5,833	17,259	460	620	160
Fayette.....	7,928	23,817	634	952	328
Ford.....	6,000	9,621	312	505	253
Franklin.....	6,200	25,493	434	633	219
Fulton.....	15,945	57,965	1,478	1,508	30
Gallatin.....	2,930	14,685	358	509	151
Greene.....	13,044	31,690	894	1,051	157
Grundy.....	12,575	8,269	416	296	.....—120
Hamilton.....	4,974	24,842	596	735	130
Hancock.....	17,009	44,561	1,230	1,510	280
Hardin.....	2,393	8,072	208	172	.....—36
Henderson.....	8,797	27,762	730	1,712	982
Henry.....	15,780	34,834	1,014	2,541	1,527
Iroquois.....	21,135	21,764	858	799	.....—59
Jackson.....	4,631	26,438	620	611	.....—9
Jasper.....	5,173	12,503	352	401	109
Jefferson.....	6,484	24,805	621	887	263
Jersey.....	7,977	16,056	480	519	39
Jo. Davies.....	18,329	34,591	1,058	1,286	228
Johnson.....	2,202	13,988	322	343	21
Kane.....	13,312	14,942	564	647	83
Kankakee.....	17,166	16,158	666	637	.....—29
Kendall.....	8,815	14,832	574	681	107
Knox.....	23,718	61,763	1,710	2,708	998
Lake.....	10,787	13,385	482	517	35
LaSalle.....	29,338	36,717	1,330	3,077	1,757
Lawrence.....	4,973	17,654	452	656	204
Lee.....	10,291	25,356	892	1,656	764
Livingston.....	14,651	28,100	854	1,182	328
Logan.....	14,312	47,437	1,234	4,221	2,987
Macon.....	7,935	29,834	754	2,214	1,460
Macoupin.....	11,846	32,395	884	1,051	167
Madison.....	6,145	52,480	1,172	2,127	955
Marion.....	7,027	31,883	578	1,034	456
Marshall.....	6,974	20,093	540	1,122	582
Mason.....	6,037	16,654	452	2,648	2,196
Massac.....	1,261	5,424	132	131	1
McDonough.....	14,066	41,091	1,102	1,362	260
McHenry.....	14,944	21,181	722	1,145	423
McLean.....	27,112	62,007	1,782	3,723	1,941
Menard.....	10,032	26,012	738	1,973	1,235
Mercer.....	15,552	41,653	1,144	2,054	910
Monroe.....	1,616	13,286	298	543	215
Montgomery.....	7,510	34,773	814	1,527	683
Morgan.....	30,809	44,553	1,506	3,168	1,662
Moultrie.....	6,635	22,300	578	1,753	1,175
Ogle.....	21,965	33,489	1,108	1,787	679
Peoria.....	9,617	35,386	900	960	69
Perry.....	3,763	14,430	362	384	22

COUNTIES.	CATTLE.	HOGS.	CONSUMP'N	CROPS.	SUR PLUS.
			at 20. In Thousands.	In Thousands	In Thousands.
Piatt.....	5,509	12,654	362	1,069	707
Pike.....	18,315	51,433	1,394	1,399	5
Pope.....	3,635	12,676	326	315	...-11
Pulaski.....	1,736	5,715	148	195	47
Putnam.....	2,809	5,431	166	334	168
Richland.....	4,054	12,256	326	482	166
Rock Island.....	12,877	26,625	790	1,459	669
Saline.....	4,542	20,576	500	531	31
Sangamon.....	26,219	76,420	2,052	4,388	2,336
Schuyler.....	8,441	23,357	636	440	...-196
Scott.....	5,958	17,285	464	752	288
Shelby.....	11,204	43,411	1,092	2,082	990
Stark.....	7,465	26,515	678	1,149	471
St. Clair.....	4,616	29,785	688	1,423	735
Stephenson.....	15,186	34,437	992	1,615	623
Tazewell.....	10,894	34,555	908	2,062	1,154
Union.....	5,127	25,145	604	670	75
Vermillion.....	24,078	50,177	1,484	2,818	1,334
Wabash.....	2,233	10,247	248	421	173
Warren.....	16,679	52,191	1,376	2,082	1,606
Washington.....	4,812	20,563	506	836	330
Wayne.....	10,524	39,427	968	1,179	181
White.....	4,787	24,765	590	870	280
Whitesides.....	22,143	37,765	1,198	2,163	965
Will.....	24,509	21,475	918	1,131	215
Williamson.....	6,354	30,281	752	655	...-77
Winnebago.....	16,124	19,354	708	1,237	529
Woodford.....	10,805	43,642	1,088	2,154	1,066
Randolph.....	5,351	24,590	598	510	...-88

This crop is subject to such sudden variations, even more in the consumption than in the production, that it cannot be claimed that the surplus will, in different years, be produced exactly in the same proportion by different counties. But the data presented suffice to show the general outlines of a corn-belt so extraordinarily productive that it can be relied upon, even in such years as 1869, to bring forth almost any quantity of maize for which there may be a demand and proper facilities for transportation. Counties like Logan, Champaign, Sangamon, Mason, Morgan, Warren, LaSalle and Henry, which, after feeding from fifty to one hundred thousand hogs and cattle, have left from one million and a half to three million bushels of corn for export, and that in a year of short corn crop, must every year stand in need of ample facilities for the movement of a large surplus of corn.

An improvement making the route to market by the river as cheap or cheaper than the route by the lakes, must greatly benefit the producers of that portion of the surplus which is nearer in cost of transportation to the river than to the lake. Considering first the distances by the sixteen railroads which traverse the corn-belt, it appears that the line of equi-distance to Chicago or St. Louis by rail, crosses the Rockford, Rock Island and St. Louis near Monmouth (179 miles to Chicago and 182 to St. Louis); cuts the



Below line of Equidistance by rail.

Surplus 27,935,000 bu.

Tract A, below Henry on
Illinois River..... 2,871,000 bu.

Tract B, Counties on Mis-
sissippi River..... 5,911,000 bu.

Total nearer river 36,717,000 bu.

Nearer lake..... 17,459,000 bu.

Whole surplus ... 54,176,000 bu.

Chicago, Burlington and Quincy below Galesburg, and passes a little below Yates City to Pekin, (163 miles to Chicago and 163 miles to St. Louis) ; thence traverses Tazewell county to McLean on the Chicago and Alton, (141 miles to Chicago and 139 to St. Louis) ; cuts the west branch of the Illinois Central and the Gilman and Springfield road near Clinton, (148 miles to Chicago, 139 miles to St. Louis) ; thence crosses to the Toledo and Wabash four and a half miles from Tolono, (137 miles to Chicago, 146 to St. Louis) ; then slopes southward, crossing the east branch of the Illinois Central near Tuscola, (150 miles from Chicago and 147 from St. Louis) ; thence crossing the Indianapolis and St. Louis near Paris (164 miles from Chicago, 170 from St. Louis), and re-crossing that road between Paris and Terre Haute, reaches the border of the State. Every point south of the line thus described is nearer by rail to St. Louis than to the lake at Chicago. The counties cut by this line will be presently considered. Those lying entirely south of it produced an estimated surplus of 27,935,000 bushels of corn, when the whole State produced 54,176,000—a little over one-half.

Counties on the navigable rivers above this line have, in going southward, the advantage of a route open from February 15th to March 1st, or from four to six weeks earlier than navigation on the lakes commences. This advantage alone, were the navigation of the river unimpeded, would be one of great importance. Thus as soon as the river opens in the spring, and after navigation by the lakes closes in the fall, corn begins to pour southward, even with the Mississippi river in its present condition, and during December of 1873 corn was moved by the train load into St. Louis by railroad from as far north as Odell, only 82 miles from Chicago, navigation by the river being still open January 1st, six weeks after the Erie canal had been closed by ice. But there is also an advantage in cost. The lowest known rate to the lake from the Mississippi River is that given in *pro rata* division with different barge lines; the railway receives nine cents for transportation from Fulton to Chicago, 130 miles, while the barge company receives six cents for transportation from Winona to Fulton, 450 miles. But St. Louis is only 398 miles below Fulton, and the barges can therefore move grain from Fulton to St. Louis for less than six cents, whenever there is water on the rapids, even now, and constantly when the long-delayed improvements at the rapids have been completed. Hence, if cost of transportation to market from St. Louis and from Chicago are equal, all grain of the Mississippi River counties would share the benefit of a choice of routes. Those river counties which

lie above the line of equi-distance by railway, including Warren, which has more than half its territory south of that line, and is not only close to the river but is traversed by the Rockford, Rock Island and St. Louis Railway, produced a surplus of 5,911,000 bushels.

On the Illinois River the advantages of an earlier season, a current favoring southward-bound cargoes, and a considerable difference of time in southward trips as compared with the trips through the locks and canal to the lakes, extend the line of equal cost as far as Henry. From the foot of the lock at that point cargoes are taken to St. Louis as cheaply as to Chicago by canal, and with very moderate improvement of the channel the cost could be still further reduced. The counties adjacent to the river, but north of the line of railway equi-distance, forming Tract "A" on the diagram, with the two also adjacent to the river and cut by the line of equi-distance, produce a surplus of 2,871,000 bushels.

Only six counties on the line of equi-distance by railway remain—Knox, DeWitt, Piatt, Champaign, Douglas, and Edgar. All are penetrated by competing lines of railway, and the advantage of an earlier season by an open route southward would extend to all. Especially, if the route opened to the southward by river improvement should prove the cheapest, these counties would be benefited, since they are equi-distant from the lake at Chicago and the river at St. Louis. But in this comparison only those shall be included of which the greater part lies south of the line of equi-distance, namely: DeWitt, Piatt, and Douglas, producing a surplus of 2,436,000 bushels.

The other three produce 4,739,000 bushels, and with the twenty-four remaining counties north of the line, 17,459,000 bushels. Thus, considering St. Louis as the point of shipment southward from which, by improvement of navigation, a cost of transportation permanently equal to that from Chicago by the lakes may be established, the counties within immediate and certain influence of such improvement produce a surplus of 36,717,000 bushels, and the counties not immediately within its reach, 17,459,000 bushels. In other words, to more than two-thirds of the surplus corn of Illinois such improvement would offer a lower cost of transportation and better market in ordinary seasons, and a choice of markets in all seasons, with earlier navigation in the spring and later in the fall. It is not necessary to say that the same benefits would extend in greater measure to the producers of the surplus west of the Mississippi. Thus, in 1870, when the entire available surplus from the crops of 1869 was one hundred millions, Illinois producing sixty-eight as

estimated from the February return of hogs, 46,500,000 came from counties in Illinois nearer in cost of transportation to the river route, and twelve millions from States west of the river—in all 58,500,000—while 21,800,000 came from counties in Illinois nearer to the lake, and fourteen millions from other States east of the river—in all, 35,800,000.

Thus far, however, the supposition has been that the improvement of the river would only equalize the cost of transportation from St. Louis and from Chicago to a market. In fact, it would do far more. It will be shown that the cost from Dubuque, by way of the river, can be reduced, without unreasonably expensive improvements, lower than the average cost from Chicago by way of the lakes. In that event, the advantages of a competing route, an earlier season, and a choice of markets, would extend to all the counties equi-distant from the lake and from the river at Dubuque, Fulton or any lower point. That line of equi-distance would pass 5 miles east of Rushville (70 miles to Chicago and 66 to the river at Fulton), 8 miles east of Rockford (93 miles from Chicago and 78 from the river at Galena), 10 miles east of Mendota (84 miles from Chicago and 66 miles from the river), and would leave nearer to the river than to the lake all of Knox, Henry, Stark, Putnam, Barron, Lee, Ogle, Stephenson and Winnebago counties, heretofore counted as nearer to the lake than to St. Louis, and one-third of LaSalle county. These produce a surplus of 7,139,000 bushels. At the same time, equality of cost from Dubuque and from Chicago would give a lower rate from St. Louis, and would extend the advantage of a lower rate to McLean, Livingston, Champaign and Edgar, upon or near the line of equi-distance. These counties produce 6,010,000 bushels, so that in all 13,149,000 bushels in addition to those hitherto estimated, or 49,866,000 bushels in all would be reached by the advantages of the river route, while only 4,310,000 bushels of the surplus of Illinois would remain beyond their reach. In other words, over eleven-twelfths of the whole surplus of corn in Illinois would share in the advantages of a cheaper route, a route opening earlier and closing later, and a choice of markets. And, returning to the estimate of sixty-eight million bushels for Illinois, sixty-two millions in that State and twelve west of the river, or seventy-four million bushels in all, would be reached by the benefits of such an improvement, while six millions in Illinois, and fourteen in other States east of the river, in all twenty millions, remain beyond their reach—if those benefits extend to no part of the surplus of Ohio.

To a large part of the surplus of Ohio, however, the same ben-

efits would extend. A glance at the crop map in the census report of 1870, shows that a large corn producing tract, in fertility only surpassed by the great central region of Illinois, occupies the southwestern portion of Ohio, extending from Columbus to the river, no portion of it being as near to the lake as to the Ohio at Cincinnati. The following table, showing the crop and consumption, estimated as before from the number of hogs and cattle given in the census report, embraces only twenty-two counties out of the eighty-eight in Ohio, and those all between Franklin and the river, or between Franklin and the Indiana line, and yet accounts for thirteen out of the seventeen million bushels of surplus :

OHIO CORN, 1870.

COUNTIES.	CROP.	CONSUMPTION.	SURPLUS.	SHEEP.
Pickaway.....	2,867	1,436	1,431	25.
Ross.....	2,313	1,362	951	24.
Fayette.....	2,055	1,282	773	34.
Franklin.....	1,826	1,208	718	40.
Butler.....	1,716	666	1,020	6.
Fairfield.....	1,706	988	718	40.
Clinton.....	1,583	950	633	39.
Green.....	1,527	852	675	29.
Warren.....	1,487	804	683	20.
Miami.....	1,293	544	749	16.
Champaign.....	1,280	606	674	8.
Hamilton.....	1,226	486	740	3.
Clarke.....	1,204	648	556	54.
Madison.....	1,164	730	434	71.
Highland.....	1,110	1,066	44	26.
Montgomery.....	1,088	670	418	7.
Darke.....	1,061	862	201	20.
Preble.....	973	732	241	10.
Clermont.....	878	615	262	13.
Brown.....	926	744	182	19.
Adams.....	772	570	202	16.
Pike.....	740	356	384	14.
Sciota.....	699	320	379	9.
			13,068	543.
Licking.....	1,556	900	656	221.
Knox.....	1,223	796	426	145.
Muskingum.....	1,198	730	468	146.
Belmont.....	1,181	672	509	103.
Coshocton.....	1,098	688	410	132.
Delaware.....	932	600	332	111.
Noble.....	853	560	290	64.
Union.....	808	564	244	76.
Perry.....	681	540	141	85.
			3,476	1,143.

Added are nine other counties, mainly adjoining Franklin on the north and east, which produce 8,508,000 bushels of the surplus (estimated from the consumption of hogs and cattle only), leaving only one million bushels produced by all the rest of the State. But in these nine counties, as the last columns show, there were 1,143,000 sheep—more than one-fifth of the whole number in the State, while in the twenty-two counties there were but 543,000, Madison

only having more than the average number to a county for the entire State. It may fairly be concluded that if the consumption of corn in Ohio is greater than the number of hogs and cattle would indicate, by reason of the use of a large quantity in feeding sheep, that excessive consumption is not in the counties of the southwestern district, but in the nine central counties and in other parts of the State. Thus, practically, the entire surplus of corn in Ohio is produced in counties so located as to share the advantages of improvement of the river, if for no other reason, because it would lessen the cost of transportation to southern consumers, who already demand a large supply of western corn.

The two districts considered—one in Ohio and one in Illinois—are the only tracts north of the Ohio and east of the Mississippi, in which a surplus of corn is regularly produced. And these, it appears, are so located that scarcely any portion of the surplus of those States in 1870, is nearer the lakes than the river, and beyond the reach of the benefits offered by improvement of their natural channels, to a market. If out of a surplus of 100,000,000 bushels of corn, barely 7,000,000 are produced in counties nearer to the lakes than to the river channels, it is no exaggeration to say that the entire corn crop, so far as it is effected at all by facilities for transportation to a market, would share the benefits to result from improvement of the natural channels of communication.

The surplus of oats is produced mainly in the northern tier of States. Comparison of the quantities produced in 1869 and 1871, with the number of horses in each State, indicates that no considerable surplus for export was produced in either year, in Ohio, Indiana, Missouri, Kansas or Nebraska, and a small quantity in Michigan in 1871 only. Wisconsin, Minnesota, Iowa and Illinois produce the surplus, and as the following memorandum shows, a consumption per horse equal to the average throughout the country, would leave for shipment from the northwestern States quantities hardly as large as were actually shipped.

OATS AND HORSES.

STATE.	1869.				1871.			
	Number of Horses.	In millions of Bushels—			Number of Horses.	In millions of Bushels—		
		Production.	Consump'n. 38 bu. each.	Surplus.		Production.	Consump'n. 30 bu. each.	Surplus.
Ohio	609,000	25.	23.7	1.3	725,000	24.9	21.9	3.
Indiana	497,000	8.	18.6	none.	663,000	11.7	19.6	none.
Missouri ..	493,000	16.5	18.6	none.	511,000	13.8	15.3	none.
Kansas	117,000	4.1	4.4	none.	180,000	4.	4.4	none.
Nebraska....	30,000	1.4	1.1	.3	41,000	1.2	1.2	none.
Michigan ..	228,000	8.9	8.4	.5	282,000	9.6	8.4	1.2
Wisconsin ..	252,000	20.	9.5	10.5	328,000	15.7	9.6	6.1
Minnesota...	93,000	10.6	3.6	7.	131,000	7.8	3.9	3.9
Illinois.....	855,000	42.	32.5	9.5	1,028,000	38.5	30.6	7.9
Iowa.....	433,000	21.	16.2	4.5	616,000	19.9	18.3	1.6
		157.5		33.6				23.7

Of the apparent surplus, 12,000,000 in 1869 and 6,600,000 in 1871 came from west of the river. Examination of the States of Illinois and Wisconsin, with reference to proximity of the counties in each to lines of transportation by water, has already justified the statement, that at least one-half of the surplus from these States is within reach of benefit by improvement of the rivers, so that not more than 10,000,000 bushels out of 20,000,000 bushels in 1871, may be regarded as naturally dependent upon lake or rail transportation.

Of the small quantity of rye shipped eastward, it is not necessary here to take account, and a consumption of barley proportioned to population would leave no considerable surplus for shipment in the northwestern States. The quantities produced, however, were in 1870, about 3,600,000 west of the river, 2,800,000 in Ohio, Michigan, and Indiana, and 4,100,000 in Illinois and Wisconsin. Whatever quantity may be shipped to distant markets, more than four-sevenths of the entire product is grown in regions to which improvement of river transportation is a vital necessity.

Of other agricultural products shipped from the northwest, the most important is the live animals. The entire movement of live stock will, from its nature, be effected by rail. The shipment of packed meats, on the other hand, could be made at much less cost from several of the largest packing points, if the obstacles to river transportation were removed. The quantity produced within the limits already marked out as nearer in cost of transportation to the northern than to the southern water-route was, in the season of 1871-2, about 439,395,047 lbs., or 219,697 tons, and the quantity produced at points on the Mississippi and its tributaries, or nearer to that route in cost of transportation, was 669,706,523 lbs., or 334,853 tons.

Of 173,000,000 lbs. of tobacco produced in the Mississippi Valley in 1870, more than four-fifths, or 140,000,000 lbs., were produced in the States of Missouri, Kentucky and Tennessee, and the portion from Ohio, Indiana and Illinois, was produced mainly in the river counties.

Alike from its location and because so large a portion of this crop is exported, the route southward is its natural one. The crop of hemp also comes from the same States—Missouri, Kentucky and Tennessee. Nor is it necessary to add that the river or its tributaries form the natural outlet for the cotton and sugar crops, and that the value of those crops to the producer would be materially enhanced by such improvements at the mouth of the river as would permit the safe entrance of the larger ocean vessels, and thus cause lower rates

of freight. The classification which has been attempted by no means proceeds upon the theory, that the full quantities of all products ascertained to be within reach of the route by the Mississippi would take that route in event of its complete improvement. On the contrary, it is firmly believed, that within the vast territory which has been surveyed the competition offered by an open and economical southern route, would push down the charges by lake and canal, or by rail, to the lowest point admitting of reasonable profit to carriers, and that this permanent and yet reasonable reduction in the cost of transportation by other routes can in no other way be as surely, speedily and safely effected. Thus while large quantities of bulky produce would doubtless be moved southward, other large quantities, though yet moved by lake or rail eastward, would obtain lower rates than are now charged, and as to either, the object now so earnestly sought, alike by statesmen producers and by consumers, would be attained, namely, exchange of products with less wasteful expenditure.

The benefits of a choice of markets and of routes : of a route open earlier and closing later than the water route eastward ; and of a cost of transportation materially reduced and permanently restrained within just limits, would extend to the movement not only of all products of the West, which from their nature can be moved by sea, but the movement of all similar products from the East or from abroad to western consumers. But the quantity and tonnage of agricultural products, so located as to be more economically moved by river than by lake or rail, whenever by desired improvements the capacities of the river route for cheap and prompt transportation shall have been fully developed may be approximately stated as follows :

	Bushels.	Tons.
Wheat (1873)	74,253,691	2,227,010
Corn (1869)	93,000,000	2,604,000
Oats (1869)	22,000,000	351,000
Barley	2,800,000	67,000
Packed Meat (lbs.)	669,706,521	334,853
Tobacco (lbs.)	173,000,000	86,500
Cotton		631,516
Sugar and Molasses		100,000
Hemp		10,000
		<hr/> 6,413,779

On the other hand, the quantities and tonnage of products not apparently within immediate reach of the benefits to be derived by improvement of the river route, may be thus stated :

	Bushels.	Tons.
Wheat (1873)	18,642,166	559,265
Corn (1869)	7,000,000	196,000
Oats (1869)	10,000,000	100,000
Barley	2,100,000	50,400
Rye	2,000,000	56,000
Packed Meat	(lbs.) 439,395,047	219,697
Live stock		<hr/> 1,500,000
		2,741,362

Thus more than two-thirds of the surplus products of Agriculture in the Mississippi Valley may be enhanced in value to the producer. Six million tons of freight ask the attention of the government. This year, for its transportation, either its producers or its consumers will be compelled to pay at least seventy millions of dollars, not including any part of the freight paid to ocean vessels. And if this quantity, and the people of the Mississippi valley who produce it, are not yet worthy of the attention of the government, it is at least certain that the limit of production in that fertile region has not yet been reached, and that its inhabitants seem not unlikely to become a majority of the whole people of these United States.

APPENDIX C.

THE ROUTE BY CANAL AND LAKE.

The Erie Canal has not only repaid to the State of New York its original cost and interest thereon from the date of its construction, the cost of all enlargements and improvements and interest thereon from date of expenditure, and the cost of maintenance and repairs, but \$41,436,490.64 clear profits besides. Yet, great as are the benefits it has conferred upon the people of that State, and of its chief city, it has been of far greater value to the people of the West. For many years it was the chief outlet for the products of the Northwest, and, as long as its capacity sufficed to move the surplus of Western products, while the centre of that surplus remained nearer the lakes than the Mississippi River, it was the most natural and cheapest outlet. But it is no longer sufficient in capacity even to control, by its competition, the rates of transportation to the seaboard. The centre of agricultural production, moving swiftly westward, has already passed the centre of Illinois, and will soon reach the Mississippi River. More than half the surplus of wheat is even now produced west of that stream. The time has come when additional facilities for transportation, of far greater capacity, and more readily accessible to the regions along the great river and beyond it, are imperatively necessary.

The Erie Canal has already been enlarged. It was originally 40 feet wide at the water surface, and four feet deep with locks 90 feet long by 15 wide, passing boats of an average burden of 70 tons. In 1835 the enlargement was authorized, and in 1862 it was completed, so that the canal is now 70 feet wide at the water surface, and 7 feet deep, with locks 110 by 18 feet, passing boats of an average burden of 210 tons. The Oswego Canal is now of the same size. Nevertheless, the Erie has not since delivered as many tons at tide-water in any year as it delivered in the year 1862 when its enlargement was completed, nor has it since carried at as low an average rate as it reached in 1859. Its average tonnage of boats has increased materially, and it was supposed that this would secure cheaper transportation. But it has not; the larger boats apparently have cost more for construction, maintenance and haulage, while the average time of a

trip has been perceptibly increased. The larger the locks, the longer it takes to fill them, and the less the number of boats which can be passed through in a given time. When the average cargo was only forty-nine tons, in 1844, the average time from Buffalo to Albany was seven days and a half; when the average cargo increased to 167 tons, in 1862, the average time increased to eight days and a half; and now that the average cargo is 190 tons, the average time is eleven days. The record of lockages shows the same fact clearly. In 1847, it appears that 6,930 boats passed Alexander's lock in a single month (October), an average of 224 daily, or five minutes and a half to a boat. But the largest number passing in any month within three years past, was in September, 1872, when 5,063 boats passed, an average of 168 daily, or eight and one-half minutes to a boat. A part of these were empty, and the boats going westward without load, pass the locks somewhat quicker than the boats with cargo eastward, so that the time actually required at that lock for the transit of loaded boats is considerably more than eight and a half minutes each, and varies also at the different locks. An official test has proved that on a lock of ten feet lift, an average of seventeen minutes each was required to pass loaded boats eastward, and only nine minutes for westward boats, mostly empty. But in the practical operation of the canal, at least as many boats must, in any month, be going eastward with cargo, as are returning without cargo. Only the monthly record of lockages at Alexander's lock is published, and it suffices to show the relative activity of the canal in different months, and its comparative capacity as actually operated at different periods. The largest movement in any month, within the last three years, was 5,063 boats per month; in July, 1862, 5,373 boats were passed at the same lock. But the half of each number represents the movement eastward; the average cargo in 1862 was only 167 tons, and in 1872 it was 190 tons; so that the largest movement eastward, in any month in 1862, was 448,896 tons, and since the great increase in size of boats, the largest movement eastward, in September, 1872, was 480,965 tons. But the gain of 32,000 tons in capacity has been balanced by a loss in the average time required to make the trip from Buffalo to Albany, which has increased from eight and a half to eleven days, and, notwithstanding a large reduction in the tolls required by the State, the cost of transportation has not been diminished, but has, in fact, slightly increased. The following table, prepared from official reports of the New York Canal Department, presents proof of these statements, and its facts are of vital importance:

THE NEW YORK CANALS.

YEAR.	Average cargo of Boats.	Days' time between Buffalo and Albany.	Freight, without toll on a barrel of Flour.	Lockages at Alexander's Lock.	Tons delivered at tide-water from Erie Canal.
1841.....	41	9	36c.	30,320	532,520
1844.....	49	7½	25	28,219	799,816
1847.....	67	10½	46	43,957	1,431,252
1848.....	71	9	27	34,911	1,184,337
1849.....	68	8¾	25	36,918	1,266,724
1850.....	76	9	26	38,444	1,554,675
1851.....	78	8½	26	40,396	1,508,677
1852.....	80	9	30	41,572	1,644,699
1853.....	84	9	33	42,967	1,851,438
1854.....	94	8½	29	35,981	1,702,693
1855.....	92	8½	29	30,873	1,420,715
1856.....	100	8½	37	31,223	1,587,130
1857.....	100	8½	23	22,182	1,117,169
1858.....	126	8½	18	23,473	1,496,687
1859.....	143	8½	16	20,274	1,451,333
1860.....	140	8½	27	32,439	2,276,001
1861.....	157	8½	27	31,179	2,449,609
1862.....	167	8½	25	34,977	2,917,094
1863.....	177	9	22	30,071	2,647,689
1864.....	150	10	34½	28,742	2,146,634
1865.....	160	10	28	26,037	2,078,361
1866.....	170	10	29	29,882	2,523,664
1867.....	156	10	25	28,654	2,226,112
1868.....	148	10	25	32,107	2,378,572
1869.....	183	10	28	24,625	2,257,689
1870.....	181	10	21½	25,124	2,290,689
1871.....	178	11	28½	29,725	2,648,877
1872.....	190	11	30½	28,035	2,670,405

This table shows the average cargo of boats each year since 1841; the average time in days between Buffalo and Albany; the average charge, tolls to the State not included, for carrying a barrel of flour eastward; the number of lockages at Alexander's lock, and the number of tons delivered at tide-water. From this table it will be seen that the enlargement, and the increase of one-sixth in the cargo of boats since 1862, has resulted in an increase of thirty per cent. in the length of time required for each trip, so that in a season of 220 days, boats can make only ten trips to Albany and back, though they formerly made thirteen; that this increase in time, with the corresponding increase in cost of haulage, has more than counter-balanced the saving in cost of transportation effected by carrying larger cargoes, so that the average charge for freight, tolls not included, has increased from 25 to 30½ cents a barrel; and that the number of boats passing had decreased nearly seven thousand, and the number of tons moved eastward nearly 277,000. From this statement

it does not appear that the increase in the capacity of the canal has been of such service as to warrant the still greater outlay now contemplated, in the hope of enabling this to hold its own in competition with other routes. In 1850, when the surplus of agricultural products in the western States could not have exceeded seventy million bushels, the Erie canal alone delivered at tide-water, 1,544,675 tons of freight; in 1862, when the surplus, according to the Agricultural reports, less than in 1860 did not exceed 140,000,000 bushels, the Erie alone moved 2,494,036 tons of agricultural products and 2,917,094 tons of all freight to tide-water; but in 1872, when the surplus was probably at least 280,000,000 bushels, the Erie moved only 1,683,000 tons of agricultural products and 2,670,405 tons of all freight to tide-water. While the surplus to be moved has increased four fold, the quantity moved by canal has not even doubled in twenty-two years, and within ten years has decreased.

Before seeking explanation of a change so remarkable, it is necessary to present some other facts of vital importance in the examination, and particularly to determine how far the canal is now used to its full monthly capacity, what is the length of the season, and what variations there have been in rates in different months. The following table, prepared from the official reports of the Canal Department, shows the lockages each month in the years named, the whole number each year, and the number of tons delivered at tide-water :

RECORD OF LOCKAGES.

IN EACH MONTH, AND THE AVERAGE EACH MONTH FOR SEVERAL PERIODS.

Yrs.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1860....	381	3,541	4,263	4,606	4,703	4,892	5,380	4,524	149	32,439
1861....	.....	3,716	4,101	3,822	3,781	4,349	5,386	5,925	99	31,179
1862....	.....	4,302	5,061	5,376	4,615	5,260	5,247	4,517	489	34,997
Average	127	3,883	4,475	4,601	4,373	4,833	5,337	4,983	245	32,871
1867....	.....	2,266	2,035	4,516	5,001	4,008	5,898	4,000	30	28,654
1868....	216	3,895	4,205	4,300	4,619	4,249	5,449	5,014	100	32,107
1869....	.....	2,751	4,176	3,663	3,483	3,720	2,208	4,925	200	24,625
Average	72	2,970	3,792	3,992	4,367	3,992	4,518	4,646	110	28,462
1870....	.....	2,252	4,308	3,825	3,674	3,474	3,880	3,549	162	25,124
1871....	471	2,820	3,710	4,173	4,151	4,972	5,046	4,082	.....	29,725
1872....	.....	1,945	4,174	4,029	3,437	5,003	4,329	3,908	.....	28,035
Average	157	2,330	4,064	4,175	3,877	4,503	4,583	3,846	54	27,628

AVERAGES COMPARED.

1860-2	127	3,883	4,475	4,601	4,373	4,833	5,337	4,988	245	32,871
1867-9..	72	2,970	3,792	3,992	4,367	3,992	4,518	4,616	110	28,462
1870-2..	157	2,339	4,004	4,175	3,877	4,503	4,583	3,846	54	27,628

From this table it appears, supposing that the canal was worked to its full capacity in September, 1872, October, 1871, 1868 and 1867, and November, 1861, that it is not employed to its full limit more

than one month in any year; that in the other most active months in 1872 there were unemployed from four to eight per cent. of its capacity, in 1871 two, twelve and sixteen per cent., and that in 1870 and 1869 it was not fully employed in any month. Casting aside April and December, in which scarcely anything is done, it appears that in seven months of 1872 at the rate of September, 35,441 boats could have passed, so that the canal was employed during those months only 75 per cent. of its capacity, or the equivalent of 5.6 months of full work; in 1871 only 5.8 months; in 1870 only 4.9 months; in 1869 only 4.8 months; in 1868 only 5.9 months; in 1867 only 4.5 months; and for the past six years an average of only 5 1-4 months of full work. Hence the capital invested in boats, teams and other equipments for transportation, must earn twelve months' interest and profits in about five months of paying employment, and the wages of all the hands employed during a season of seven to eight months must be earned by charges based on only about five months' full employment. It appears, however, that the use of the canal has grown much less steady and complete since 1862, for in that year it was employed the equivalent of 6.5 months of full work, in 1861 the equivalent of 5.2 months, and in 1860 fully six months—an average of 5.9 months. The loss of two-thirds of a month in opportunity to earn wages for hands and profits for capital, by some change in the current of trade since 1861, is equivalent to a necessary increase of 10 per cent. in the cost of transportation. The record shows that this change is a marked falling off in the movement in May, June, July, August and November, as compared with 1860-62, and a greater concentration of the business done upon the months of September and October. This change has been going on for many years, as will appear from the following comparison of the average number of boats passing the same lock in different months of the years 1846-50, inclusive, and in 1867-72, inclusive:

	1846-50.	1867-72.
May.....	5,524	2,654
June.....	5,140	3,928
July.....	5,052	4,083
August.....	4,690	4,122
September.....	5,052	4,247
October.....	5,945	4,550
November.....	5,647	4,246
Three Spring months, 1846-50.....	15,716	
“ Fall “ “.....	16,644	
Three Spring months, 1867-72.....	10,665	
“ Fall “ “.....	13,043	

These figures suggest one cause of the decrease of traffic by

canal namely, that the corn-crop, which formerly waited until the canal opened, and then crowded the boats during the spring months, now goes forward largely during the winter by rail. But another cause will be found in the record of the dates of the opening and closing of the canal in different years. In 1828 the canal opened March 27th; in 1873 it opened May 15th. In 1832, it closed Dec. 21st; in 1873, it was closed by frost Nov. 20th. The following table gives the average of the officially recorded dates since 1824, for different periods:

LENGTH OF SEASON ON THE CANAL.

	AVERAGE DATE OF		Days in
	Opening.	Closing.	Season.
1824-30.....	April 19.....	Dec. 17.....	241
1831-40.....	April 19.....	Dec. 8.....	232
1841-50.....	April 24.....	Dec. 1.....	221
1851-60.....	April 25.....	Dec. 10.....	229
1861-65.....	May 1.....	Dec. 10.....	224
1866-70.....	May 4.....	Dec. 10.....	220
1871-73.....	May 7.....	Nov. 27.....	204

LATEST SEASONS.

1872.....	May 13.....	Nov. 30.....	202
1873.....	May 15.....	Nov. 20.....	189

Earliest opening, March 27, 1828.

Latest opening, May 15, 1873.

Earliest closing, November 20, 1873.

Latest closing, December 21, 1832.

Longest season of navigation, 269 days, in 1828.

Shortest season of navigation, 189 days, in 1873.

Largest number of boats passing Lock No. 26 in any year, 43,957 in 1847, and in any month, 6,930 in October of 1847, an average of 224 each day.

From this it appears, that the average date of opening the canal was for its seventeen earliest years, April 19th; in 1872 and 1873 it has been nearly one month later. The average date of closing for twenty years was Dec. 10th; it has recently been a little earlier. The average season has thus been decreased from 240 days to 204 days, and in 1873 to 189 days. Thus the time which the farmers of the west have to wait before their corn crop can reach a market by canal in the spring, has been increased about one month, and at the same time the length of the season during which the wheat crop can reach market by canal in the fall, has decreased.

It is still essential to a full comprehension of the deficiencies of the canal route to compare rates for freight eastward and westward, and monthly rates eastward. The following tables show, first, the average rate charged per ton from Albany to Buffalo, the tolls, and the charge of the transporter; and second, rates charged per ton from Buffalo to Albany

YEAR.	ALBANY TO BUFFALO.			BUFFALO TO ALBANY.		
	Average yearly.	Tolls to State.	Carriers' charge.	Average yearly.	Tolls to State.	Carriers' charge.
1830.....	\$20 00	\$10 22	\$9 78	\$9 07	\$5 11	\$ 3 96
1831.....	20 80	10 22	9 58	8 89	5 11	3 78
1832.....	20 00	10 22	9 78	9 26	5 11	4 15
1833.....	14 80	8 76	6 04	8 15	3 65	4 50
1834.....	16 40	6 57	9 83	7 68	3 28	4 40
1835.....	16 00	6 57	9 43	6 29	3 28	3 01
1836.....	21 00	6 57	14 43	7 13	3 28	3 85
1837.....	18 00	6 57	12 03	7 50	3 28	4 22
1838.....	17 80	6 57	11 23	6 76	3 28	3 48
1839.....	17 80	6 57	11 23	6 94	3 28	3 62
1840.....	16 60	6 57	10 03	7 50	3 28	4 22
1841.....	12 20	6 57	5 63	6 57	3 28	3 29
1842.....	13 20	6 57	6 63	6 02	3 28	2 74
1843.....	11 20	6 57	4 63	5 56	3 28	2 28
1844.....	13 00	6 57	6 43	5 56	3 28	2 28
1845.....	9 60	6 57	3 03	6 57	3 28	3 29
1846.....	8 00	4 80	3 20	5 92	2 92	3 00
1847.....	7 80	4 80	3 00	7 13	2 92	4 21
1848.....	7 80	4 80	3 00	5 37	2 92	2 45
1849.....	7 80	4 80	3 80	5 18	2 92	2 26
1850.....	7 20	4 80	2 40	5 48	2 92	2 56
1851.....	6 20	4 40	1 80	4 71	2 19	2 52
1852.....	5 20	2 92	2 28	4 90	2 19	2 71
1853.....	5 60	2 92	2 68	5 18	2 19	2 99
1854.....	5 00	2 92	2 08	4 81	2 19	2 62
1855.....	5 00	2 92	2 08	4 81	2 19	2 62
1856.....	5 40	2 92	2 48	5 56	2 19	3 37
1857.....	4 80	2 92	1 88	4 26	2 19	2 07
1858.....	2 80	1 47	1 34	3 14	1 46	1 68
1859.....	2 40	70	1 70	2 87	1 41	1 46
1860.....	2 40	1 46	1 00	3 88	1 41	2 47
1861.....	2 20	1 40	80	4 26	1 76	2 50
1862.....	2 50	1 40	1 10	4 42	2 11	2 31
1863.....	2 50	1 40	1 10	4 17	2 11	2 06
1864.....	2 60	1 05	1 55	4 32	2 11	3 21
1865.....	2 50	1 05	1 45	4 72	2 11	2 61
1866.....	2 60	1 05	1 55	4 82	2 11	2 71
1867.....	2 60	1 05	1 55	4 44	2 11	2 33
1868.....	2 60	1 05	1 55	4 44	2 11	2 33
1869.....	2 60	1 05	1 55	4 72	2 11	2 61
1870.....	2 60	1 05	1 55	3 06	1 05	2 01
1871.....	2 60	1 05	1 55	3 70	1 05	2 65
1872.....	2 60	1 05	1 55	3 70	1 05	2 65
1830—33.....	18 65	9 85	8 80	8 84	4 74	4 10
1834—37.....	18 00	6 57	11 43	7 15	3 28	3 87
1838—41.....	16 10	6 57	9 53	6 94	3 28	3 66
1842—45.....	11 75	6 57	5 98	5 93	3 28	2 65
1846—49.....	7 85	4 80	3 05	5 90	2 92	2 98
1850—53.....	6 05	3 76	2 29	5 07	2 37	2 70
1854—57.....	5 05	2 92	2 13	4 86	2 19	2 67
1858—61.....	2 45	1 24	1 21	3 54	1 51	2 03
1862—64.....	2 52	1 22	1 30	4 66	2 11	2 55
1866—69.....	2 60	1 05	1 55	4 60	2 11	2 49
1870—72.....	2 60	1 05	1 55	3 49	1 05	2 44

Here it appears that the charge on westward bound freight was formerly more than double the charge on eastward bound freight—a difference quite in keeping with the greater average value in proportion to weight, of manufactured products and imported goods shipped westward than of agricultural and forest products shipped eastward. But from the earliest record the westward charge has been reduced more rapidly than the eastward—a change peculiarly rapid from 1850 when the railroads to the lakes were completed and began competition for freight sufficiently valuable to pay railroad charges. In 1850, the charge westward was \$7.20 per ton; in 1851 it was \$6.20; in 1852 it was \$5.20; in 1857 it was \$4.80, and in 1858 it was \$2.80. Here we have evidence of the desperate effort of the canal to retain, by extraordinary reduction in charges, its share of the westward bound traffic—an effort evidently unsuccessful, for after falling to \$2.20 in 1861, the rates returned to \$2.50, because little of that traffic could be retained at any charge whatever. On the other hand, the eastward rate was \$5.48 in 1850; was still \$5.56 in 1856, and \$4.26 in 1861. During this time the State tolls had been reduced on westward freight, from \$4.80 in 1850, to seventy cents in 1859, while the tolls on eastward freight were reduced from \$2.92 in 1850, to \$1.41 in 1859, but were raised again in 1861. The State plainly shared for the time the hope of the transporters—that westward freight might be retained by reduction of charges—but became convinced in 1861 that it must collect the greater part of its revenue from eastward freight, and raised its tolls thereon. In 1870, finding that eastward as well as westward freight was being driven from the canal, the State reduced its rates, and they have since been \$1.05 per ton eastward. Turning now to the charges by the transporter, we find that while two-thirds of the entire charge in 1850 was taken off, leaving only eighty cents per ton in 1861, it was found that even this did not check the tendency of westward freight to other routes, and since that time, also, a coal business has been developed, which now affords to westward bound boats over three-fourths of what employment they have. On the other hand, the charge for eastward freight reached its lowest point—\$1.46, in 1859—and has since largely increased. In 1871 and 1872 it was higher than it had been in any two successive years since 1853.

These remarkable changes suggest a difficulty inherent in transportation, not only by the Erie, but by every other canal depending upon east and west traffic, namely: that the eastward freight is, in its nature, far more bulky and less valuable per ton than the west-

ward, so that a very much larger share of the westward freight can afford to seek more expensive modes of transportation. The consequence is that the westward bound boats have little business, and the eastward freight is therefore forced to pay a large proportion of the cost of the whole trip. The following table shows that there has for years, been an enormous preponderance in the eastward bound freight :

NEW YORK CANALS—EASTWARD AND WESTWARD MOVEMENT IN TONS.

YEAR.	Arriving at tide-water.	Going from tide-water.	Coal ascending.
1836.....	696,347	133,796	5,436
1837.....	611,781	122,130	6,460
1838.....	640,481	140,802	6,472
1839.....	602,128	142,035	7,504
1840.....	669,012	120,586	6,054
1841.....	774,334	162,715	9,383
1842.....	666,676	123,294	7,714
1843.....	836,861	143,595	9,738
1844.....	1,019,094	176,727	14,939
1845.....	1,204,943	195,000	18,809
1846.....	1,362,319	213,295	17,599
1847.....	1,744,283	288,161	32,359
1848.....	1,447,905	329,557	39,592
1849.....	1,579,946	315,550	37,531
1850.....	2,033,863	418,370	46,732
1851.....	1,977,151	467,961	67,204
1852.....	2,334,828	521,527	69,923
1853.....	2,505,787	584,141	95,333
1854.....	3,223,743	531,831	92,806
1855.....	1,895,593	504,696	95,746
1856.....	2,123,469	573,733	142,692
1857.....	1,617,187	340,170	116,211
1858.....	1,985,142	287,073	144,276
1859.....	2,121,672	317,459	142,495
1860.....	2,854,877	373,735	154,928
1861.....	2,980,144	340,736	170,795
1862.....	3,402,709	417,623	173,381
1863.....	3,274,727	456,800	232,807
1864.....	2,805,257	493,913	268,772
1865.....	2,730,181	458,684	249,414
1866.....	3,305,607	226,974	367,296
1867.....	3,029,695	792,573	463,932
1868.....	3,240,806	1,067,020	600,677
1869.....	3,096,142	722,201	434,624
1870.....	3,156,302	940,429	567,508
1871.....	3,614,287	801,538	392,158
1872.....	3,647,944	926,228	582,529

From 1850 to 1861, the tonnage going from tide water decreased very largely, notwithstanding the great reduction of rates already

observed. After 1861, the shipment of coal westward and northward by canals, rapidly increased, and in 1872, of 926,228 tons going from tide water it appears that no less than 582,529 tons were of coal. Deducting this, it appears that 371,638 tons of other freight were moved from tide water in 1850 when the railroads were opened and the competition between the routes began, and 343,699 tons in 1872. This fact is of the most vital importance, in view of the many plans offered for cheapening transportation by constructing new canals, for the same inability to secure westward freight will compel eastward freight, on any other canal, to pay nearly the whole cost of the trip both ways. But for the demand in western manufactories for anthracite coal, this canal would, to-day, be reduced to less than one ton of freight westward, for ten tons eastward—nine boats out of ten must return empty. To any other projected canal which has not access to the anthracite supply, this fact is of some importance, for the west is amply supplied with bituminous coal. Moreover, even with that traffic, the average tonnage from tide water, for two years, has been only 863,000 tons, against 3,630,000 to tide-water, or less than one in four, so that more than three-fourths of the eastward bound boats must return empty, and each eastward cargo must pay three-fourths of the cost of the return trip. Nor is this by any means the worst phase of the matter. Of the tonnage starting from tide-water, a quantity goes northward by the Champlain, and a considerable portion is left at the various cities and stations along the Erie and other canals, and pays freight for only a part of the trip. Of 272,138 tons of merchandise going from tide-water in 1872, it appears that 32,676 tons went northward by way of the Champlain canal; that 91,867 tons were left at various points along the Erie, and that only 156,965 tons went through, being destined to western States. Of manufactures only 76,000 tons of salt went westward by Buffalo or Oswego; and of coal only 337,000 tons went westward from the river, while 251,143 tons were shipped from Montezuma, a point only 153 miles from Buffalo, thus employing, if it had all gone to Buffalo, only 3-7 of the westward trip. The following statement of tolls received on up-freight and on down-freight, (p. 29 Report of Auditor Canal Department, 1872,) probably gives a better idea than any other record of the relative traffic each way:

EAST AND WEST TRAFFIC.

YEAR.	TOLLS TO THE STATE.		CHARGES OF CARRIERS.	
	On up Freight. Merchandise.	On down Freight. Produce.	On up Freight. Merchandise.	On down Freight. Produce.
1837.....	380,826	911,797	692,411	1,198,362
1838.....	526,911	1,064,000	830,284	1,155,200
1839.....	535,486	1,080,896	843,796	1,266,193
1840.....	427,966	1,347,781	648,433	1,771,369
1841.....	558,003	1,476,879	473,457	1,519,075
1842.....	393,875	1,355,321	393,857	1,161,703
1843.....	502,617	1,578,973	350,309	1,127,838
1844.....	585,147	1,861,227	567,415	1,329,448
1845.....	625,900	2,020,281	284,500	1,500,780
1846.....	546,227	2,209,879	364,151	2,352,452
1847.....	670,979	2,964,402	419,362	4,398,790
1848.....	779,420	2,472,973	487,137	2,153,870
1849.....	769,913	2,498,313	481,195	2,014,768
1850.....	756,887	2,517,022	378,438	2,111,051
1851.....	877,438	2,452,289	358,951	2,713,171
1852.....	674,881	2,443,363	494,913	3,186,995
1853.....	719,762	2,484,956	623,794	3,565,372
1854.....	638,039	2,135,527	554,494	2,554,795
1855.....	660,105	2,144,972	470,212	2,566,131
1856.....	585,891	2,162,321	497,606	3,327,407
1857.....	342,410	1,703,231	220,456	1,609,903
1858.....	159,439	1,951,315	146,334	2,245,349
1859.....	112,542	1,611,403	273,316	1,668,545
1860.....	223,885	2,785,712	159,918	4,879,935
1861.....	107,958	3,800,827	61,691	5,398,902
1862.....	161,056	5,027,387	126,937	5,464,551
1863.....	137,253	4,507,954	107,842	4,311,956
1864.....	117,692	3,886,290	173,736	5,881,891
1865.....	111,879	3,728,076	154,500	4,611,506
1866.....	131,021	4,305,618	193,412	5,530,000
1867.....	163,368	3,924,690	241,162	4,433,899
1868.....	206,393	4,040,168	304,678	4,461,418
1869.....	166,160	3,612,341	245,284	4,468,346
1870.....	132,155	2,479,423	195,086	4,746,324
1871.....	140,199	2,960,639	206,960	7,472,089
1872.....	160,793	2,911,708	237,228	7,339,072

To the tolls here given for "up freight" should properly be added about \$18,000 for salt moved westward in 1872, and about \$70,000 (or 40 per cent.) for coal moved westward—the records do not state what proportion of the quantity shipped at Montezuma or other interior stations went in either direction. The comparison for 1872 would then stand thus: Tolls on westward freight \$248,703, tolls on eastward freight \$2,823,000; eastward to westward tolls as eleven to one. It is very clear that if of eleven boats going eastward ten have to return empty, and ten out of eleven tons going eastward have to pay the cost of transportation returning as well as going,

the effect upon charges must be very important. Any increase in the capacity of this canal would only increase this disproportion, since it would have no tendency to increase the westward but only the eastward tonnage. The former enlargement increased the tonnage eastward from 2,000,000 tons in 1859, when the average tonnage of boats was only 76, to 2,980,000 in 1861, when the average tonnage was 157, and to 3,647,944 tons in 1872 when the average tonnage was 190, but the westward traffic decreased from 418,000 in 1850 to 340,000 in 1861, and only advanced to 926,000 in 1872, when a large proportion, as has been shown, went northward or stopped at local points on the different canals. A farther enlargement, unless some new westward traffic like that in coal should spring up, would probably increase the eastward tonnage without increase of the westward, thus compelling each ton eastward to pay a still larger proportion of the return trip, and would at the same time involve still greater delay in the passage of the larger locks, and still greater cost of haulage. And the same conditions apply to the construction or enlargement of any other canal.

It remains to show how the pressure of the eastern traffic, no longer measurably distributed through seven months as it was in former times, affects monthly charges for freight. For this purpose the rates by lake as well as canal must be compared, since the two in some measure depend upon each other. The following tables give the average rate per bushel on wheat and corn each month in certain years, first from Chicago to Buffalo, second from Buffalo to New York by canal and river, and third the total charge for transportation by that route. The rates by way of Oswego, it may be remarked, though never varying widely from those here given, have since 1867 been a shade higher, on corn in every month except three, and on corn and wheat in every year :

CHICAGO TO BUFFALO—BY LAKE.

RATES FOR WHEAT.

The figures in these tables represent cents, mills, and tenths of mills.

Yrs.	May.	June.	July.	August.	Sept.	Oct.	Nov.
1857...	5 2 5	5 3 5	6 6 2	10 8 1	14 3 0	15 8 8	11 0 8
1858...	3 8 1	4 1 8	4 2 0	3 0 0	3 6 2	4 2 5	3 2 5
1859...	3 6 1	4 2 5	3 5 0	3 4 4	5 5 0	7 3 7	7 8 7
1860...	5 2 5	5 3 5	6 6 2	10 8 1	14 3 0	15 8 7	11 0 8
Av'ge.	4 4 8	4 7 8	5 2 3	7 0 1	9 4 3	10 8 4	8 4 2
1861...	7 2 5	6 8 8	5 7 5	10 0 0	14 0 0	18 6 3	16 0 8
1862...	6 8 1	8 5 0	12 0 0	7 4 4	10 5 0	12 8 8	15 3 1
1863...	8 7 6	10 0 5	5 7 7	4 7 5	5 7 5	8 4 8	9 0 4
1864...	8 5 6	13 4 4	6 8 1	8 2 5	8 0 0	8 2 5	13 7 5
Av'ge.	7 8 4	9 7 1	7 5 8	7 6 1	9 5 6	12 0 6	13 5 4
1865...	7 3 1	6 6 3	8 3 7	7 1 9	11 6 3	14 9 4	12 3 7
1866...	12 5 0	15 6 3	11 6 3	10 3 7	12 7 5	17 4 4	13 5 0
1867...	5 5 0	5 5 0	4 7 5	5 5 0	8 1 3	9 3 1	8 0 0
1868...	5 2 5	5 3 1	4 2 5	7 8 1	9 1 9	8 8 1	9 3 1
1869...	5 8 3	7 5 0	4 7 5	5 2 5	6 5 6	7 5 6	10 2 5
Av'ge.	7 2 7	8 1 1	6 7 5	7 2 2	9 6 5	12 0 1	10 6 8
1870...	4 8 9	5 8 8	5 1 3	5 0 6	4 7 5	7 3 1	8 1 3
1871...	4 5 0	5 6 9	5 0 9	6 0 7	9 2 5	13 3 1	9 5 0
1872...	8 3 7	8 3 7	8 8 1	9 5 6	14 5 6	16 5 6	11 8 1
Av'ge.	5 9 2	6 6 4	6 3 3	6 8 9	9 5 2	12 3 9	9 8 1

CHICAGO TO BUFFALO BY LAKE.

RATES FOR CORN.

YEAR.	May.	June.	July.	August.	September.	October.	November.
1857 ..	4 3 1	4 3 0	5 2 6	9 5 6	11 1 0	14 8 8	10 8 3
58 ..	3 2 5	3 7 5	3 6 0	2 5 6	3 1 2	3 7 0	2 7 5
59...	3 2 5	3 7 0	3 0 0	2 9 4	5 0 0	6 8 7	7 4 4
60 ..	4 3 1	4 3 0	5 5 6	9 5 6	13 0 5	14 8 7	10 8 0
Av'ge.	3 7 8	4 0 1	4 3 5	6 1 5	10 5 7	10 0 8	7 9 5
1861 ..	6 3 7	6 3 1	5 2 5	8 8 1	12 9 3	17 2 5	14 7 5
62...	6 1 5	7 6 9	11 0 6	6 6 9	9 5 0	11 8 7	14 2 5
63...	7 8 3	9 0 6	4 9 5	4 2 5	4 7 5	7 2 9	7 7 8
64...	8 0 6	12 5 6	6 3 2	7 7 5	7 5 0	7 6 2	12 7 5
Av'ge.	7 1 0	8 9 0	6 3 9	6 8 7	8 6 9	11 0 0	12 3 8
1865 ..	6 7 5	6 0 0	7 9 4	6 6 9	10 7 5	13 8 8	11 5 0
66...	11 1 9	13 6 2	9 6 3	8 4 1	10 3 7	15 2 5	11 7 5
67...	4 2 5	3 7 5	3 8 8	4 1 8	7 0 0	7 9 3	7 0 0
68...	4 0 6	4 2 5	3 6 3	6 6 2	7 7 5	7 7 5	8 3 1
69...	5 5 0	7 1 9	4 3 8	4 6 2	6 0 0	7 0 6	9 1 7
Av'ge.	6 3 5	6 9 6	5 8 9	6 1 1	8 3 7	10 3 7	9 5 4
1870...	4 6 3	5 3 1	4 6 3	4 6 3	4 3 1	6 8 8	7 6 3
71...	4 0 6	5 3 2	4 5 0	5 5 6	8 6 9	12 3 7	8 0 2
72...	7 8 3	7 6 2	8 0 0	8 8 7	13 5 0	15 5 0	10 8 1
Av'ge.	5 5 0	6 0 8	5 7 1	6 3 5	8 8 3	11 5 8	9 1 2

BUFFALO TO NEW YORK—CANAL AND RIVER.

RATES FOR WHEAT.

YRS.	May.	June.	July.	August.	September.	October.	November.
1857...	17 3 3	15 6 2	13 3 0	13 8 8	14 4 0	16 2 5	17 0 0
1858...	14 1 2	10 6 2	19 1 0	11 7 5	12 1 2	13 6 0	13 3 3
1859...	11 1 0	11 2 5	11 1 0	10 6 3	11 5 0	14 7 0	17 3 3
1860...	12 5 5	11 6 9	11 8 5	13 5 0	16 0 0	16 3 0	22 6 7
Av'ge.	13 7 7	12 2 9	13 8 3	12 4 4	13 5 0	15 2 1	17 5 8
1861...	13 8 7	11 3 8	11 5 0	11 8 1	15 7 5	20 3 1	25 6 6
1862...	13 5 0	12 8 1	14 2 5	15 1 2	17 2 5	18 3 1	19 6 3
1863...	14 6 9	14 3 3	14 6 9	13 9 3	14 0 8	16 4 4	19 6 1
1864...	16 8 8	18 1 9	19 0 0	21 3 1	18 4 4	18 7 5	18 6 2
Av'ge.	14 7 3	14 1 7	14 8 6	15 5 4	16 3 8	18 4 5	20 7 0
1865...	14 7 5	13 6 9	14 4 4	14 5 0	15 6 9	21 7 5	23 1 0
1866...	13 8 2	10 6 5	17 8 9	16 2 8	17 6 0	18 1 1	20 5 4
1867...	12 3 3	13 2 5	13 8 8	13 7 5	16 3 1	21 1 9	19 1 3
1868...	14 5 6	13 5 7	13 7 5	14 1 3	16 2 5	18 0 0	19 2 5
1869...	13 7 5	13 6 9	12 9 4	13 7 5	16 0 0	21 6 9	22 3 4
Av'ge.	13 8 4	14 7 7	14 5 8	14 4 8	16 3 7	20 1 4	20 6 7
1870...	11 5 6	10 6 9	10 3 1	10 0 0	10 6 9	13 3 1	13 0 0
1871...	11 6 2	10 2 0	11 1 2	11 7 5	13 6 2	13 9 4	13 0 6
1872...	9 8 7	12 3 7	14 5 0	12 1 2	12 3 1	14 5 6	16 0 0
Av'ge.	10 0 1	11 0 8	11 9 7	11 2 9	12 3 0	13 9 5	14 6 8

TOTAL AVERAGE—1857-60.

Lake..	4 4 8	4 7 8	5 2 3	7 0 1	9 4 3	10 8 4	8 4 2
Canal..	13 7 7	12 2 9	13 8 3	12 4 4	13 5 0	15 2 1	17 5 8
Total..	18 2 2	17 0 7	19 0 6	19 4 5	22 9 5	26 0 5	26 0 0

AVERAGE—1861-64.

Lake..	7 8 4	9 7 1	7 5 8	7 6 1	9 5 6	12 0 6	13 5 4
Canal..	14 7 3	14 1 7	14 8 6	15 5 4	16 3 8	18 4 5	20 7 0
Total..	22 5 7	23 8 8	22 4 4	23 1 5	25 9 4	30 5 1	34 2 4

AVERAGE—1865-69.

Lake..	7 2 7	8 1 1	6 7 5	7 2 2	9 6 5	12 0 1	10 0 8
Canal..	13 8 4	14 7 7	14 5 8	14 4 8	16 3 7	20 1 4	20 6 7
Total..	21 1 1	22 8 8	21 3 3	21 7 0	26 0 2	32 1 5	31 3 5

AVERAGE—1870-72.

Lake..	5 9 2	6 6 4	6 3 3	6 8 9	9 5 2	12 3 9	9 8 1
Canal..	10 0 1	11 0 8	11 9 7	11 2 9	12 3 0	13 9 3	14 6 8
Total..	15 9 3	17 7 2	18 3 0	18 1 8	21 8 2	26 3 2	24 4 9

To these charges by Lake and Canal, to obtain the whole cost of transportation, there must be added Insurance rates, and two cents per bushel for elevator charges at Buffalo.

BUFFALO TO NEW YORK, CANAL AND RIVER.

RATES FOR CORN.

YEAR.	May.	June.	July.	August.	September.	October.	November.
1857...	13 8 3	11 6 2	10 5 0	10 2 5	11 3 0	13 0 0	14 5 0
58...	12 0 0	9 1 2	10 6 0	10 2 5	10 6 2	12 1 0	12 0 8
59...	9 6 0	9 7 5	9 8 0	9 3 8	10 3 7	13 5 0	15 8 3
60...	11 1 0	10 0 6	10 3 0	12 6 2	14 6 2	14 8 0	20 5 0
Av'ge.	11 6 2	10 1 3	10 3 0	13 1 2	11 7 2	13 3 5	15 7 2
1861.	12 8 1	10 3 8	10 5 6	10 8 1	14 5 0	18 3 8	23 5 8
62..	11 5 0	10 8 1	12 2 5	13 1 3	15 1 8	16 1 2	17 3 1
63...	12 6 9	12 3 3	12 6 9	11 9 3	12 0 8	14 4 4	17 6 1
64...	14 8 7	16 2 5	16 9 4	18 8 1	16 3 8	16 1 9	16 4 2
Av'ge.	12 9 6	12 4 4	13 1 1	13 6 7	14 5 3	16 2 8	16 2 3
1865...	12 7 5	11 6 9	12 4 4	12 5 0	13 6 9	19 2 5	20 3 7
66..	11 6 3	14 3 7	14 8 8	13 3 1	14 6 3	14 8 7	16 3 8
67...	10 3 3	11 2 5	11 8 8	11 7 5	13 4 4	18 1 9	16 3 8
68...	11 8 1	11 0 7	11 2 5	11 6 3	13 6 8	15 3 7	16 2 5
69...	11 6 2	11 6 9	10 9 4	11 7 5	15 7 5	18 4 4	18 8 4
Av'ge.	11 6 2	12 0 4	12 2 8	12 1 9	13 8 3	17 2 2	17 6 4
1870...	10 7 5	10 0 0	9 5 6	9 3 1	9 9 4	12 4 4	10 4 1
71...	10 6 2	9 2 0	10 1 2	10 7 5	12 6 3	12 9 4	14 5 0
72...	9 0 0	11 0 6	10 5 0	11 1 8	11 1 2	12 8 7	14 0 0
Av'ge.	10 1 2	10 0 8	10 0 6	10 4 1	11 2 3	12 7 5	12 9 7

TOTAL AVERAGE, 1857-60.

Lake..	3 7 8	4 0 1	4 3 5	6 1 5	10 5 7	10 0 8	7 9 5
Canal.	11 6 3	10 1 3	10 3 0	13 1 2	11 7 2	13 3 5	15 7 2
Total..	15 4 1	14 1 3	14 6 5	19 2 7	22 2 9	23 4 3	23 6 7

AVERAGE, 1861-4.

Lake..	7 1 0	8 9 0	6 3 9	6 8 7	8 6 9	11 0 0	12 3 8
Canal.	12 9 6	12 4 4	13 1 1	13 6 7	14 5 3	16 2 8	16 2 3
Total..	20 0 6	21 3 4	19 5 0	20 5 4	23 2 2	27 2 8	28 6 1

AVERAGE, 1865-9.

Lake..	6 3 5	6 9 6	5 8 9	6 1 1	8 3 7	10 3 7	9 5 4
Canal.	11 6 2	12 0 1	12 2 8	12 1 9	13 8 3	17 2 2	17 6 4
Total..	17 9 7	18 9 7	18 1 7	18 3 0	22 2 0	27 5 9	27 1 8

AVERAGE, 1870-2.

Lake..	5 5 0	6 0 8	5 7 1	6 3 4	8 8 3	11 5 8	9 1 2
Canal.	10 1 2	10 0 8	10 0 6	10 4 1	11 2 3	12 7 5	12 9 7
Total..	15 6 2	16 1 6	15 7 7	16 7 6	20 0 6	24 3 3	22 0 9

These tables, compiled from the official records presented, for the earlier years in the report of the New York Produce Exchange, and for the later years in the report of the Auditor of the Canal Department, will be found of vital importance, inasmuch as they show not merely the charge in each month of each year, but the average in the same month for each series of years. Temporary or local causes are apt to derange rates, either on the lake or by canal, during any particular month, but general and permanent causes only can account for differences of rate maintained constantly in the averages for sixteen years. Adding to the whole charge for transportation, the 2 cents charged for transfer by the elevators in Buffalo, we have the following, the rates given being per bushel, in cents and hundredths of cents, and the average rates for each month through each series of years :

CORN RATES.

	1857-60.	1861-4.	1865-9.	1870-2
May	17.41	22.06	19.97	17.62
June	16.13	23.34	20.97	18.16
July	16.15	21.50	20.17	17.77
August.....	21.27	22.54	20.30	18.76
September	24.29	25.22	24.20	22.06
October.....	25.43	29.28	29.59	24.33
November.....	25.67	30.61	29.28	24.09

WHEAT RATES.

	20.25	24.57	23.11	17.93
May	20.25	24.57	23.11	17.93
June	19.07	25.88	24.88	19.72
July.....	21.06	24.44	23.33	20.30
August.....	21.45	25.15	23.70	20.18
September	24.93	27.94	28.02	23.82
October.....	28.05	32.51	34.15	28.32
November.....	28.00	34.24	33.35	26.49

The last column gives the average rate since the reduction of tolls by the State from \$2.11 per ton to \$1.05 per ton, or from 6 to 3 cents per bushel, and it shows that charge for transportation, tolls excluded, has been very nearly the same, month for month, as it was before that reduction. Moreover, the State having reduced its tolls from about five cents a bushel during the first period to three cents during the last, it appears that the charge for transportation, other than for tolls, has been slightly increased since 1860. And through all these changes in tolls and rates, before, during, and since the war, the same relative charge in the different months has been maintained. Both on the lake and on the canal there has been free competition, and it must be concluded that the average rates have been pushed as low as the inherent conditions of the traffic will permit, and that the increase of rates in the fall months, as well on the lake as on the canal, is the result of a cause operating alike year

after year. This cause is evidently the fact to which the record of lockages on the canal has already called attention, namely, that the existing facilities for transportation upon this route are not fully employed more than one or two months in the year, and are then insufficient to meet the demand. The number of boats, hands, and teams in service is at least sufficient to move 5,063 cargoes in one month in 1872, but they were actually employed during seven months only, the equivalent of $5\frac{1}{2}$ months' full work. During May, June, July, and August they never find full employment, and then transporters bid against each other so sharply that rates are kept down near if not below actual cost; during September, October, and part of November, on the other hand, the quantity of freight to be moved is largely beyond the capacity of the route, and the rates are then pushed high enough to secure a living profit on the whole year's work. In consequence, it appears that the higher rates are those at which the full shipments of grain are actually moved. In November, also, shippers begin to apprehend that cargoes may be caught by closing of navigation before reaching their destination, and rates of insurance as well as of freight attain the maximum, so that the shipments begin to decrease rapidly during that month, the capacity of that route is less than half employed, and the rates by lake fall. The following record of shipments, monthly from Chicago, serves to illustrate still more clearly the effect of these conditions, and shows at what rates the bulk of the crops is actually moved:—

[SEE NEXT PAGE.]

In August grain began to go forward at the rate of over two millions a week, and the rates, which opened at $8\frac{1}{4}$ cents, rose by the 10th to $9\frac{1}{2}$ cents, and by the 17th to $12\frac{1}{4}$ cents, an increase of fifty per cent. Supposing that the crops to be moved ordinarily come forward in the same proportion in different months, and applying the average rates for the last three years instead of those of 1872, it appears that of sixty millions of bushels of grain shipped by lake from Chicago, 28 millions go forward during the four months and ten days prior to the advance of rates in August at a cost of nearly 18 cents for corn (17.93) and $19\frac{1}{2}$ cents for wheat, besides insurance; that three millions more go forward at about 20 cents for corn and $21\frac{1}{2}$ cents for wheat in the middle of August; that 12,800,000 go forward in the latter part of August and September at an average of 22 and 24 cents (23.82); that 11,500,000 more go forward in October at an average rate of $24\frac{1}{2}$ and $28\frac{1}{2}$ cents; and that 4,700,000 go forward in November at an average of 24 and $26\frac{1}{2}$ cents. The rates for 1871, and especially for 1872, were even higher than these averages.

CHICAGO SHIPMENTS—MONTHLY.

NAVIGATION OPENED APRIL 28, AND CLOSED NOVEMBER 29,

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
By Lake, Flour...	.....	.....	.....	1,137	47,998	32,725	26,918	23,905	38,850	31,490	20,246	188
" " " " " "	.....	.....	.....	49,532	272,591	519,564	492,722	2,487,016	1,280,590	2,465,626	1,264,229	.....
" " " " " "	.....	.....	.....	1,445,606	2,568,080	6,850,326	7,574,131	7,829,558	6,264,918	6,819,201	2,214,145	22,521
" " " " " "	.....	.....	.....	12,000	571,834	1,536,109	1,449,913	805,457	549,071	797,137	514,641	2,000
" " " " " "	.....	.....	.....	.....	.....	25,500	86,084	12,900	34,114	16,827	56,113	.....
" " " " " "	.....	.....	.....	19,088	40,125	26,555	47,792	40,125	431,406	1,175,466	549,936	.....
Fl'as Wh't, Total	.....	.....	13,000	1,652,133	3,652,620	9,121,089	9,785,232	11,294,581	8,754,349	11,431,707	4,700,294	25,861
By R'y E. Flour .	69,574	68,114	81,128	95,396	91,201	83,899	44,530	45,656	54,998	104,584	128,283	154,605
" " " " " "	23,211	34,880	70,135	183,950	239,655	78,121	57,512	320,941	341,619	280,619	388,472	335,695
" " " " " "	719,383	532,426	440,608	1,017,638	693,636	378,386	262,358	321,887	433,057	322,471	177,405	90,147
" " " " " "	320,648	239,534	316,219	546,164	533,697	837,656	255,234	459,391	792,726	713,155	355,668	483,237
" " " " " "	35,589	23,461	35,090	42,952	79,906	58,622	27,474	49,393	56,684	43,572	36,038	23,934
" " " " " "	102,848	156,384	205,274	136,184	46,764	97,314	33,376	65,118	416,684	603,889	304,912	288,650
Fl'as Wh't, Total	1,549,549	1,327,255	1,472,966	2,403,858	2,049,663	1,869,594	858,604	1,445,010	2,315,160	2,495,626	1,903,910	1,994,688

It will now be plain why the number of vessels on the lake, and of boats on the canal, is not so increased as to reduce freight charges. The number of boats on the canal which can be profitably employed is limited by the capacity of the locks to pass them in the busiest month. The number of vessels on the lake which can be profitably engaged in moving grain to the canal, is limited by the capacity of the canal to forward it, and by the lack of adequate employment except in the busiest grain months. Even those now employed must be idle a considerable portion of the time. The shipments from Chicago show that the existing lake fleet can move at least eleven and a half million bushels in a month, or eighty million bushels in seven months, so that in 1872, they had paying freight eastward just three-fourths of the time; in other words, one-fourth of their time was lost, and they were forced in five months and one-fourth to earn seven months' wages for hands and running expenses, and twelve months' wear and waste and interest on capital. Thus the lake fleet appears to be a little less fully employed than the canal fleet, and the same causes operate to increase the necessary cost of transportation by both. With the lake fleet as with the canal boats, the westward bound freight is altogether deficient, and the eastward freight has to pay a large share of the cost of the return trip. This rule does not fully apply, it is true, to the propellers which are owned by railway companies, or run in connection with lines of railroad, because these receive large quantities of westward freight of a class which the canal has lost. But these vessels on the other hand, are not of the number employed in delivering grain for shipment by canal, and the latter class must depend chiefly upon the canal for return freight, because there is never delivered at the lakes, by the railroads, more westward freight than their own lines of steamers can transport. These vessels which run in connection with the railroads, therefore, should be able to bear somewhat lower rates for eastward freight than others, because they have secured a larger return cargo, and a railway company having such steamers is able to put its through rates for grain a little lower than it could if competing with the canal on equal terms. But the entire freight received at Chicago from the lower lake ports, freight by propellers of the railway lines included, was only about 700,000 tons in 1872, while the grain alone shipped eastward by lake was over 1,700,000 tons. Allowing for the proportion of westward freight brought by the railway lines of steamers, it is evident that the vessels which move grain in connection with the canals, fare not much better as to return traffic than the canal transporters themselves. In fact they often return empty to the upper lakes, thence taking cargoes of lumber down Lake Michigan.

The review of the conditions under which the lake and canal route operates, has certainly shown that there is little hope of great reduction in the cost of transportation by that route. Already, in spite of the many difficulties of the route by the Welland canal and St. Lawrence, elsewhere considered, a steadily increasing proportion of the grain exported takes that route. In the three years, 1870-72, the exports of wheat and flour from New York were about 30 per cent. less than in the three years, 1861-63, and the shipments from Buffalo by canal about 40 per cent., while the shipments via Welland canal to Canadian ports were nearly 20 per cent. greater in the three years, 1870-2, than in the three years, 1861-63. Already the canal is deprived by railroad competition of a considerable part of the grain which comes eastward to Buffalo. Out of 2,029,602 barrels of flour and 82,328,126 bushels of grain received at Buffalo in 1872, the canal reports show that not a barrel of flour and only 48,474,399 bushels of grain were shipped on the canals. Finally, as has been observed, a large and very rapidly increasing proportion of the crops is moved forward by rail, directly from the producer or from Western shipping points, to the consumer or exporter. In plain truth, the Erie canal is losing its grain traffic with astonishing rapidity, and is even beaten in competition by the railroads more severely every year. The statement is by no means a pleasing one to those who realize that only by competition with free water routes can rates by rail be constantly, permanently, and sufficiently restrained, but no wise physician wishes to be ignorant of the nature of the disease he has to treat. The Erie canal is ceasing to afford, by successful competition, that protection against railroad charges which it formerly gave. The following table, prepared from official records, shows the number of tons of agricultural products moved on all the New York canals, and the tons of vegetable food moved on the New York Central, the Erie, and the Pennsylvania Central railroads in the years named:

TONS OF VEGETABLE FOOD MOVED.

YEARS.	N. Y. Canals.	Welland.	Total by Water.	Total by Rail.	N. Y. Central.	Erie.	Penn- sylvania.
1861.....	2,144,373	556,583	2,730,956	905,521	441,562	213,059	220,000
1862.....	2,494,036	721,149	3,215,185	957,754	460,885	261,824	225,045
1863.....	2,236,975	558,489	2,794,564	914,241	405,380	228,632	280,229
1864.....	1,572,835	144,561	1,717,397	1,016,143	461,511	215,686	338,646
1865.....	1,606,091	350,668	2,046,699	906,607	343,103	212,677	344,827
1866.....	1,783,060	439,487	2,225,547	1,204,820	453,663	397,923	353,194
1867.....	1,438,517	341,975	1,780,492	1,183,449	495,191	277,432	410,843
1868.....	1,410,141	495,873	1,906,014	1,456,001	598,680	302,451	854,871
1869.....	1,314,071	503,869	1,817,940	1,570,914	764,831	322,078	483,105
1870.....	1,306,153	506,749	1,925,602	2,039,880	1,297,481	468,076	873,423
1871.....	1,863,868	668,076	2,531,944	3,057,168	1,459,919	745,070	851,579
1872.....	1,683,962	625,891	2,309,853	2,770,614	1,158,894	711,720	900,000

Whereas, the New York canals in 1861 moved two and a half millions of tons of agricultural products, and the three railroads only 900,000 tons, in 1872 the canals moved only 1,683,962 tons, and the three railroads 2,670,614 tons. The contrast is still more striking when we consider only the movement by the Erie canal and the two New York roads which directly compete with it, for in 1862 there were shipped from Buffalo by canal 881,350 tons of wheat and flour, and in 1872 only 330,591 tons; in 1862 there were shipped from Buffalo by canal, of all grain, 1,575,468 tons, and in 1872 only 1,322,204 tons. Meanwhile the quantity of vegetable food moved by the New York Central and the Erie railroads increased from 731,000 tons in 1862 to 1,871,000 tons in 1872. Yet the crop of cereals increased in the same period from twelve to fifteen hundred million bushels. Nor was this loss of the grain traffic by the Erie canal caused by an increase in the quantity moved by the Welland canal, either via Oswego, or down the St. Lawrence. For the table shows that the whole quantity moved by water, over all the New York canals and over the Welland also, has decreased from 3,215,185 tons in 1862 to 2,531,944 tons in 1871, and 2,309,853 in 1872, while the quantity moved by the two New York roads alone had increased over one hundred and fifty per cent., and the quantity moved over the three railroads had advanced from 906,754 tons to 3,057,168 tons, or over two hundred per cent. In this battle the canals have suffered not a defeat, but an absolute rout.

It may be supposed that this change has been due to the increase of shipments from minor western points direct to eastern consumers. But comparison of the direction of shipments from Chicago, the very headquarters of the lake traffic, will show that the Erie and Welland canals have lost, not only a large proportion of all grain going eastward even from that point, but also some proportion of all-grain going thence eastward by lake.

	SHIPPED EAST.		SHIPPED EAST.	
	Lake, 1862.	Lake, 1872.	Rail, 1862.	Rail, 1872.
Flour.....	1,057,843	223,457	652,961	1,022,968
Wheat.....	13,466,295	8,831,870	292,213	2,363,810
Corn.....	29,009,928	41,589,508	125,162	5,388,402
Oats.....	2,709,494	6,370,784	357,451	5,853,319
Rye.....	849,650	231,338	12,516	512,115
Barley.....	350,103	2,330,523	91,640	2,457,397
Grain.....	40,385,490	59,354,353	876,982	16,575,043
Flour.....	5,289,215	1,117,155	3,364,805	5,114,840
Total.....	45,674,685	60,471,508	4,241,787	21,689,883

Setting aside the flour, which, being more valuable in proportion to bulk, bears rail transportation better than grain, and the shipments of which from Chicago have considerably decreased, it appears that only 877,000 bushels of grain were moved from Chicago by rail direct in 1862—barely two per cent. of the whole eastward shipment. But in 1872 there were moved by rail direct, even from this chief port of the lakes, over 16,500,000 bushels, or nearly twenty-two per cent. of the whole eastward shipment—a loss both to the lake and to the canal of nearly twenty per cent. And again, since the canals have lost 683,000 tons of their grain traffic in 1862, or twenty-one per cent., while the shipments by lake from Chicago have increased from forty to fifty-nine millions, it follows that all this increase of shipments by lake has gone by rail from lower lake ports, and this increase alone is twenty-five per cent. more of all shipments eastward from Chicago. In fact, supposing that half the shipments in 1862 by the New York Central and Erie were of grain brought to Buffalo or Dunkirk by lake, the account would stand thus:

SHIPMENTS FROM LAKE PORTS

	Per cent. 1862.	Per cent. 1872.
By rail through.....	2	22
By lake.....	98	78
By lake to rail	14	36
By lake to canals.....	84	42

If there has been such a change in the shipments from the chief lake port, what must be the tendency of grain grown at a distance east or south of that point? It is manifest that the New York canal has ceased, in effect, to be a competitor for the grain traffic, and that even the lake moves a smaller proportion of the crops than it did ten years ago. These startling facts are of the most vital importance in the discussion of proposed measures for relief. If the railroads are already depriving the Erie canal of a business which it once monopolized, what help can be expected from other proposed canals of similar magnitude? If, in spite of the enlargement of the Erie, completed in 1862, the canal, though once possessing control of 84 per cent. of the grain shipments from western lakes, has since been reduced to 42 per cent. of those shipments and has become almost impotent as a restraining competitor, with what reason can new routes be expected to gain the control which this one has lost, or another enlargement be expected to restore the mastery in spite of the increased delay and cost of transportation, which further enlargement would be likely to involve?

APPENDIX D.

RAILROADS, EXISTING AND POSSIBLE.

Marking the defeat of canals in competition with railways, many have rushed to the conclusion that cheaper transportation can be reached only by building new roads, or by regulation of railways now in operation. This conclusion rests upon a blunder, namely, that railways have wrested traffic from the canals by carrying more safely, more speedily, or at lower rates between the same points.

Clearly, unless the railway system possesses some important advantage, it would not have been able to deprive the route by lake and canal of some part of the grain traffic, which it formerly enjoyed, and moreover, to monopolize all the increase in the grain traffic since 1862. But it is equally clear, that in order to account for this great change in the direction of traffic, the advantage must be one which did not formerly exist. Hence that change cannot be supposed to result only from the general and permanent advantages of movement in separate cars, with greater safety, or under charge of a particular company, for all these existed prior to 1862, and affect now, as then, a comparatively small portion of the traffic. Neither can the change be ascribed to the use of propellers on the lakes in connection with railways from Buffalo, Dunkirk, or other ports, for prior to 1862, at least seven such lines were in operation, with fifty-seven steamers, of which seventeen connected with the New York Central. Nor have advertised rates by "lake and rail" been lower than rates by lake and canal. In point of time, the railroads had a greater advantage in 1862, than they have now, for the customary over-crowding of roads and blocking of trains in the fall, since the railroads began to move a large share of the grain, have much increased, and have taught people to expect little gain over the time required for movement by the canals. And as to rates, it is a well known fact, that the usual summer tariff on grain, 45 cents per 100 lbs. from Chicago to New York, with charges from and to other points in some measure adjusted to this as a

standard, has scarcely been changed at all for ten years, and has not been reduced as much as rates *via* the Erie canal, or as rail charges for some other kinds of freight.

The following table is calculated from the official reports of different roads, as to number of tons moved one mile, and gross freight receipts in certain years. Such data being not accessible for all the years as to some roads, in a few cases (marked thus: *), estimates from other data have been inserted for the sake of completeness. The receipts per ton per mile, stated in cents and decimals of cents, are thus contrasted:

RAILROADS.	1853.	1854.	1855.	1856.		1858.	1859.	1860.	1861.
New York Central.....	3.37	3.05	3.20	2.97	3.13	2.59	2.13	2.06	1.96
Erie.....	2.49	2.57	2.42	2.48	2.45	2.33	2.17	1.84	1.73

RAILROADS.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
N. Y. Central.....	2.22	2.40	2.75	3.31	2.92	2.53	2.59	2.20	1.86	1.65	1.50
Erie.....	1.89	2.09	2.31	2.76	2.45	2.04	1.92	1.60	1.37	1.47	1.50
Pennsylvania†.....	2.12	2.18	3.12	2.66	2.28	*2.20	1.91	1.72	1.55	*1.50	1.41
Boston & Albany....	2.58	2.75	3.01	3.55	3.16	2.98	2.81	24.3	2.26	2.03	2.01
Central New Jersey...	1.97	2.15	2.51	2.93	2.71	2.24	2.22	*2.04	*2.04	*2.18	1.48
Northern Central.....	*1.88	1.88	3.00	3.24	3.28	2.94	2.22	*2.01	*1.85	*1.75	1.66
Lake Shore.....	2.02	2.10	2.30	2.83	2.90	2.50	2.43	2.34	1.51	1.40	1.38
Michigan Central....	1.90	1.99	2.25	3.00	2.60	2.49	2.45	2.90	1.98	1.61	1.56
Pitts. Ft. W. & Ch....	1.90	2.01	2.38	2.44	2.02	1.95	1.70	*1.52	*1.42	1.42	1.44
Average.....	2.05	2.17	2.62	3.03	2.70	2.43	2.23	2.08	1.76	1.67	1.56

† A more exact statement for the Pennsylvania Central is for 1868, 1,906; for 1869, 1,718; for 1870, 1,549; for 1872, 1,416. The rate on the Baltimore and Ohio is not ascertainable.

These railroads not only carry a very large proportion of the grain moved by rail, but practically control the through rate from Chicago and other western points. Moreover, the grain traffic forms so large a part of the business of the New York Central, Erie, and several others, that no material change of rates on that traffic could be made without an important change in aggregate freight receipts. The figures show clearly how sharp has been the competition between some of these roads; they show, especially, the long contest between the New York Central and Erie for through traffic, beginning in 1853, after the consolidation of the roads now forming the New York Central, and continuing until nearly half of the average rate formerly charged has been abated; and they show, also, that upon these roads, and every other in the list, there has been a reduction since 1862, amounting, in the average for all, to nearly

one-fourth of the rate then charged. Yet since 1860 or 1862, there has been no such reduction in the rate for grain, as the following comparison of the railroad tariffs for freight from Chicago to New York will show :

RAILROAD TARIFF FOR 1860.

	FROM CHICAGO TO NEW YORK				
	Wheat.	Flour.	Corn.	Packed Meats.	Dressed Hogs.
January	65	\$1.30	65	65	\$1.00
February	65	1.30	65	65	1.00
March	65	1.30	65	65	1.00
April	65	1.30	65	65	1.00
May	45	95	45	45	
June	45	95	45	45	
July	50	95	50	50	
August	50	1.00	50	50	
September	50	1.00	50	50	
October	62	1.23	62	62	97
November	65	1.30	65	65	1.00
December	65	1.30	65	65	1.00

RAILROAD TARIFF FOR 1872.

	FROM CHICAGO TO NEW YORK				
	Wheat	Flour.	Corn.	Packed Meats.	Dressed Hogs.
January	65	\$1.30	65	75	90
February	65	1.30	65	75	90
March 1st to March 24th	65	1.30	65	75	90
March 25th to April 30th	60	1.20	60	70	90
May	50	1.00	50	60	
June	50	1.00	50	60	
July	50	1.00	50	60	
August 1st to to August 11th	50	1.00	50	60	
August 12th to August 25th	45	90	45	55	
August 26th to September 1st	45	90	45	55	
September 2d to September 8th	50	1.00	50	60	
September 9th to September 15th	55	1.10	65	60	
September 16th to October 13th	60	1.20	60	70	
October 14th to November 19th	65	1.30	65	75	85
November 20th to December 31st	65	1.30	65	75	85

Rates for flour, per barrel; for wheat and other articles, per 100 lbs.

The average by days in 1872 is 58 cts. per 100 lbs. on grain, and the average by months in 1860 (the records being differently kept) was 57 cts. per 100 lbs., but at the same time some reduction in charges for other freight will be observed. Two conclusions are inevitable—when the very sharp competition between the railroads and the canals is remembered, as well as the competition between railroads themselves, by which rates on some other kinds of freight and average charges for all freight were reduced—that as early as 1860 the railroads had already put their rates for grain as low during the months of open navigation as they could afford, and that the remarkable loss of this particular traffic by the canals has not been

due to changes of railroad rates. These conclusions are high degree important, and call attention to the comparative cost of moving different kinds of freight.

In examination of rates by lake and canal, it appeared that the loss of time—the irregular employment of costly facilities for transportation—was a large element in the cost of moving the bulky agricultural products of the West. But the outlay of capital required for the transportation of a given quantity of freight is much larger for the carriers upon railroads than upon canals. Consequently, during a part of the year, inability to employ the facilities purchased, and to earn interest on that capital, necessitates a still greater addition to charges, when the facilities are fully employed, in order to earn interest for lost time. But in this respect grain is a kind of freight peculiarly costly to move, because it is both bulky and peculiarly irregular in its movement. The cars and engines required in order to move the quantity of grain offering in one year may not be required at all the next, if the crop is short, or if failure of some other crop prompts larger consumption, or if low prices induce the farmers to hold their product, or if a particular demand happens in localities more economically reached by some other route. But, passing these causes of wide fluctuation, the movement of grain is in its nature periodical, and must be very much greater in one part of the year than during any other. The cars and engines sufficient to meet the enormous demand then arising, it is not only likely, but in the case of a road depending largely upon this traffic, absolutely certain, will not all be fully employed again during the year. Whatever portion of them is at other times unemployed, represents a capital lying idle three-fourths of the year, and forced to earn twelve months' interest by charges for three months' work. The same principle applies in less degree to the wages of hands employed. Coal, ore, petroleum, and many manufactured products, afford a steady employment the year round to the carrier, but grain does not. Moreover, with the railroad as with the canal, the eastward movement must pay a large part of the expense of the westward; the cars which go east with grain must be brought back generally empty. The usual estimate is, that about three tons go eastward to one westward; but, as early as 1862, the New York Central moved 1,064,128 tons eastward, and only 323,305 tons westward, and yet at that time it moved only 441,562 tons of vegetable food. These causes operate constantly, in greater or less degree, upon all roads which carry grain largely, to render the cost of doing that business somewhat larger than the cost of transporting freight

of a kind more regular in its movement, or more nearly balanced in the quantity of return shipments. Doubtless the railroads would charge for grain carriage at least as much as the average for all freight, but for the fact that the low value of grain in proportion to bulk fixes a limit, beyond which charges for transportation would become virtually prohibitory. In fact, in order to move grain at all from the distant western States, the railroads were obliged at the outset to put their charges much below the average rate for all freight, and, in effect, to charge some other traffic more than its actual cost in order to gain a business, which if not taken at less than was then at times its actual cost, would go to other routes. Thus it happens that during the past thirteen years, there has been a considerable reduction in average freight charges, and still the rates for grain are below that average, and have scarcely been reduced at all.

The true cause of the diversion of the grain business from the canals is suggested, first, by facts already given, showing the steady decrease in the surplus of grain produced by the older States lying adjacent to the lakes; second, by the rapid increase in the surplus produced by the more distant western States; and third, by the following table of average freight receipts per ton per mile on three of the roads which penetrate the great grain growing districts, the Chicago, Rock Island and Pacific, the Chicago, Burlington and Quincy, and the Illinois Central:

	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872
Chicago, Rock I ^d & Pacific.	2.85	2.56	3.50	3.40	3.05	2.35	2.99	2.74	2.65	2.49
C. Burlington & Quincy.....	2.35	2.55	3.64	3.69	2.88	3.18	3.24	3.60	2.39	2.10
Illinois Central.....	1.95	2.51	3.10	3.19	2.90	2.46	2.48	2.31	2.32	2.10
Average.....	2.32	2.54	3.41	3.42	2.94	2.99	2.90	2.70	2.45	2.23

From 1863 to 1872, the reduction in the average rate on eastern roads was from 2.17 to 1.56, or twenty-eight per cent., but during the same time the reduction on the western roads has been from 2.32 to 2.23, or less than four per cent. Yet few, if any other western roads have secured a larger traffic than these, and the transportation upon the three roads increased from 218,228,704 tons moved one mile in 1863, to 681,912,588 tons moved one mile in 1872, or 142 per cent. Moreover, of other roads west or south of Lake Michigan, whose rates are known, none carry at a less rate than two cents per ton per mile, and nearly all at a higher rate than those named above. The rate for 1872, on the Chicago and Northwestern, was 2.61; on the Winona and St. Peter, in 1871, it was over four cents; on the Milwaukee and St. Paul in that year it was two cents, and

on the Western Union it was 2.4 cents; on the Des Moines Valley, in 1872, it was 2.53; on the St. Paul and Pacific about $3\frac{1}{2}$ cents; on the Southern Minnesota 3 cents; and on the Sheboygan and Fon du Lac (1871) 2.80. The rate on the Ohio and Mississippi in 1872 was 2.01; on the St. Louis and Iron Mountain 2.44; on the Hannibal and St. Joseph 2.16; on the Atlantic and Pacific 3.74; on the Kansas Pacific 3.17; and on the Missouri, Kansas and Texas 4.5 cents. These facts show that the average rates, necessarily higher upon roads comparatively new, or in a country sparsely settled, are much higher west and south of Chicago than upon the roads thence eastward.

From this circumstance, it follows that the cost of reaching the lakes, for grain grown beyond or at a considerable distance south of them, becomes a most important element in the cost of reaching a market, and that the through rates by rail to the East are often lower than the cost of moving grain to the lakes by rail, and thence by water eastward. For grain shipped to Chicago and thence by lake must pay 4 cents per bushel, elevator charges at Chicago and Buffalo, besides insurance on the lakes—expenses which are avoided in shipping by rail direct. In combination with the eastern trunk lines, which are compelled to carry at low rates in order to compete with the water route, the western roads make through rates by rail very much lower in proportion than their own charges for moving grain to the lakes. For example, at 36 to 39 cents per ton, grain was shipped in 1872 from Burlington to New York, by rail all the way, going through Chicago, because the rate by rail to the lake was 15 cents per bushel, and by lake and canal, elevator charges included, never less than $22\frac{1}{4}$ cents, and in one month rising above 35 cents. For the same reason, grain went directly East by rail at a rate ranging from 33 to 36 cents from Decatur, in the heart of the great corn region, because the rate to Chicago was 13 cents. It is noticeable that along the only route by which grain from Central Illinois can reach the lake by water, namely, the Illinois River and canal, the advertised rates by rail directly eastward are a little lower than at other points nearer to New York, but compelled to rely upon the rail alone for transportation to the lakes. Thus, the September rate from Pekin and Peoria to New York was 36 cents per bushel of wheat, and from Alton only $36\frac{2}{3}$, although from Bloomington and Springfield at the same time it was 39 cents. For by the river and canal grain is moved to Chicago from Pekin for 6 cents per bushel, and, adding elevator charges and the September lake and canal rates, could be delivered in New York by that route

for $36\frac{7}{8}$ cents; consequently, the all-rail route was put at 36 cents, three cents lower from that point than from Bloomington, 45 miles nearer New York. On the other hand, the farther any point is from the lakes, not in distance, but in cost of transportation, the higher are the rail rates eastward from that point. The following table, showing the distances of certain points from New York, the rates thither according to the schedule of September, 1872, and the rate per ton per mile, will illustrate this fact:

	Distance.	Rate per cwt.	Wheat per bu.	Popu- lat'n.
Chicago.....	899	50	30	1.11 $\frac{1}{2}$
Springfield.....	1,062	65	39	1.22
Bloomington.....	1,037	65	39	1.25
Burlington.....	1,122	65	39	1.16
Quincy.....	1,176	65	39	1.10
Pekin.....	1,082	60	36	1.11
Peoria.....	1,072	60	36	1.12
Alton.....	1,060	61	36 2-3	1.15
Evansville.....	1,021	60	36	1.17
Terre Haute.....	912	57	34 1-5	1.25
St. Louis.....	1,084	65	39	1.20
Lafayette.....	903	50	30	1.11
Indianapolis.....	838	50	30	1.19
Fort Wayne.....	763	44	26 1-2	1.16
Madison.....	850	55	33	1.29
Cincinnati.....	744	47	28	1.27
Toledo.....	742	40	24	1.08

NOTES.—Rates for September, 1872, from Chicago:

	Wheat.	Corn.
Lake rate, in cents, mills and fractions, per bu.....	14.5.6	13.5.0
Canal rate " " " "	12.3.1	11.1.2
	26.8.7	24.6.2

From Bloomington, Springfield, Quincy and St. Louis the all-rail route is 39 cents, because rates to Chicago were at least 10 cents, elevator there and at Buffalo 4 cents. = 40.8.7. But from Pekin and Peoria, and even Alton, the rate is 36 cents, because being on the river, the rate to Chicago is at times 6 cents, +2+2+26.8.7=36.8.7.

Another fact is necessary to make the operation of these railway rates entirely clear, namely, that the transportation of freight a short distance by rail is necessarily much more costly per mile than the transportation of the same freight a long distance over the same road. In the busy season, every car can earn (at two cents per ton per mile) from \$20 to \$30 per day, but if it runs only ten miles it must lose a day, and earn only \$2. The motive power required for through trains is fully employed, but the engine which must stop to take one car after another from small local stations cannot start with a full train, and must expend part of its time and fuel without full employment. Railroad tariffs are so adjusted that the rate per ton per mile rises very rapidly as the distance to which freight is to be moved approaches the minimum, and while there is often unjust

discrimination in local rates, some advance of rate finds justification in the greater actual cost of such transportation. As an example of the tariffs actually framed to meet this difficulty, the "Special grain tariff" of the Illinois Central Railroad, put in force March 1st, 1872, may be quoted; from points 23 miles distant or less to Chicago, 9 cents per 100 lbs.; from points 30 miles distant or less, 10 cents; from a point 34 miles distant, 11 cents; 40 miles, 12 cents; 47 miles, 13 cents; 56 miles, 14 cents; 64 miles, 15 cents; 69 miles, 16 cents; 77 miles, 17 cents; 81-88 miles, 18 cents; 93 miles, 19 cents; 99-103 miles, 20 cents; 108-128 miles, 21 cents; 133-147 miles, 22 cents; 150 miles, 24 cents; 158-172 miles, 25 cents; 180 miles, 26 cents; 184-199 miles, 27 cents; 206 to 211 miles, 28 cents; and from 214 to 365 miles, 30 cents. From Cairo, 365 miles, grain could be moved to Chicago for 18 cents per bushel, but from Gilman, only 81 miles, it cost 10.8 cents. At such rates, from very many localities not far distant, the cost of transportation to the lakes by rail is so great that the through rail route eastward is often the cheaper. Thus Gilman lies above the northern border of the great corn region of Illinois, but shipments of corn thence to Chicago, at the rate just quoted, would cost 10 cents per bushel; adding elevator charges, and the September rate by lake and canal, it would cost $38\frac{6}{10}$ cents to reach New York by way of the lakes, besides insurance, while the all-rail route was only 36.4 cents even from Bloomington, much further west. The same principle applies to almost every point in the great corn-growing district of Illinois, and in some measure to the whole region west of the river, and to part of Wisconsin. It is no longer a mystery that a very large quantity of grain, and especially of corn from Central Illinois, goes eastward by rail.

Chicago shipments, which include the grain moved through that city by rail, and the rates, when compared with the rates by lake, show clearly that the quantity thus forced to take the all-rail route is large, and afford some means of measuring the tax thus imposed upon the producers. The following memorandum shows the number of days during 1871 and 1872, and during the season of lake and canal navigation in each year, in which the several all-rail rates from Chicago to New York were in force; the average rate in each year and during each season of navigation with canal and lake rates for the same season; the quantities of grain (in tons) recorded as shipped from Chicago by rail during the time each rate was in force in 1872; the sums to which the freight would have amounted had all such shipments in 1872 been made to New York, with the average

per ton for the whole year, and separately for the season of navigation; the sum which the same shipments, if made to New York, would have cost at lake and canal rates, elevator charges at Chicago added:

RAIL RATES FROM CHICAGO.

RATES PER 100 LBS.	NUMBER OF DAYS IN FORCE.			
	During Navigation.		Whole Year.	
	1871.	1872.	1871.	1872.
65 cents.....	36	48	68	162
60 ".....	23	28	39	65
55 ".....	11	7	62	7
50 ".....	41	99	70	111
45 ".....	82	20	99	20
40 ".....	27	..	27	...
Average rate, cents.....	50.66	54.62	52.61	58.26
Equivalent per bushel wheat.....	30.39	32.77	31.56	34.85
Lake and Canal rates per bushel wheat.	22.24	26.25	.....	.....

RAIL SHIPMENTS FROM CHICAGO IN 1872.

MONTH.	Rate N. Y. per ton.	Tons.	Cost.
January.....	\$13 00	38,112	\$495,456
February.....	13 00	34,432	447,616
March.....	13 00	35,940	467,220
April.....	12 00	59,368	712,416
May.....	10 00	49,572	495,720
June.....	10 00	40,229	402,290
July.....	10 00	19,135	191,350
August, 1-3.....	10 00	{ 34,609 }	115,360
August, 2-3.....	9 00		207,657
September, $\frac{1}{4}$	10 00	{ 54,248 }	135,620
" $\frac{1}{4}$	11 00		141,182
" $\frac{1}{2}$	12 00		325,488
October, $\frac{1}{2}$	12 00	{ 55,439 }	332,628
" $\frac{1}{2}$	13 00		360,347
November.....	13 00	44 431	577,603
December.....	13 00	44 219	574,847
		509,734	\$5,990,800

Average per year, \$11.75 per ton.

During navigation, 297,663. Cost, 3,293,245.

Average by canal, \$8.83. Cost, 2,628,364.

The fact that shipments so large were made during the season of navigation, at a rate, if from Chicago to New York, 6 $\frac{3}{4}$ cts. per bushel higher than the canal and lake rates, with elevator charges at Chicago and Buffalo added, indicates that the greater portion of

the grain thus shipped was in fact forced by high rail rates to the lakes, to choose the more costly mode of transportation from Chicago eastward, and that the average effect of such local rates was equivalent to a tax of $6\frac{2}{3}$ cts. per bushel, or \$2.23 per ton on the freight thus moved.

With intent to avoid such burdens, and recover that use of the route by lake and canal from which rail rates to the lakes virtually debar them, the producers have demanded regulation of freight rates. The justice and necessity of prohibiting unjust discriminations against shipments over part of a road in order to force shipments over the whole road will scarcely be disputed by those who know how persistently rates, virtually prohibitory, have been imposed upon shipments to the Mississippi river, by roads desiring to secure for themselves and their connecting lines the transportation through to the east by rail of the products of States west of the Mississippi. But it must not be forgotten that higher charges upon western than upon some eastern roads are unavoidable, and that local traffic is in some degree necessarily more costly than through traffic. On the other hand, there are many who believe that a railroad to the east, built and managed for freight business exclusively, will give great relief to western agriculture. That passenger trains, running at high speed, wear a track more than freight trains *of the same weight*, but moved at low speed, is doubtless true, but the number of miles run by passenger and freight trains on the great trunk roads compares as follows:

	PASSENGER.	FREIGHT.
New York Central	4 076,900	7,911,251
Pennsylvania	2,909,374	10,471,583
Erie.....	3,314,453	9,004,051
Total.....	10,300,627	27,386,885

When the immense weight of freight trains, of fifteen to twenty cars each, is contrasted with the weight of passenger coaches and their occupants, it is not quite clear that a railway for freight alone would not wear out a track quite as fast in proportion to its earnings as the roads of mixed traffic. As to the possibility of moving freight at greatly reduced rates, experience upon the most prosperous and economically managed roads affords a test better than many theories.

The table hitherto given (p. 62), showing the average freight earnings of the most important eastern roads, includes those which are reputed to enjoy as efficient and economical management as any in the country, which are in such close competition with each other, with other roads whose statistics are not known, or with water-routes,

as to be forced to reduce as far as possible their operating expenses, and which possess a larger freight business than any other roads in the country, and should therefore be able to do that business at a lower rate per ton per mile. In an address last spring before the American Association of Civil Engineers, at Louisville, Mr. W. P. Shinn, formerly General Freight Agent of the P., F. W. & Chicago, stated that freight had been taken by one of these routes, doubtless referring to the Fort Wayne & Pennsylvania combination, from Chicago to New York, at seven mills per ton per mile, and he maintained that even at this rate the traffic was profitable. Facts given in the official report of the Pennsylvania Central Company do not seem to warrant this conclusion. The actual cost of transportation is there stated (for the year 1872) at .866 of a cent per ton per mile. The number of tons carried one mile on the Pennsylvania was 1,190,052,975—a larger business than is done by any other known road in the country. If that traffic had all been charged one cent per ton per mile, it would have yielded \$11,900,239.74, whereas the earnings from freight were \$16,856,891.41: the reduction would therefore have been \$4,956,362.27; and as the net earnings that year were \$8,247,852.18, there would have remained \$3,291,489.91, or, after paying 6 per cent. interest on a bonded debt of \$35,072,300, only \$1,187,152 as earnings of a capital stock of \$53,271,937—about two per cent. Thus, had the passenger charges remained the same, and the freight business been done at an average charge of one cent per ton per mile, the road could not have earned more than about two per cent. on its investment of capital. Taking the whole route from Chicago to Pittsburgh, the result is a little more favorable, because the operating expenses of the Pittsburgh, Fort Wayne & Chicago were much lower, and the cost of that road very much less. But the number of tons carried one mile on the whole route was 1,677,905,446, and the net earnings, had the passenger business been the same, and the average freight charges only one cent per ton per mile, would have been \$5,826,106, which after paying 6 per cent. on a total bonded indebtedness of \$48,693,309, would have left \$2,004,502 as the profits upon a capital stock of \$85,514,209, or only $3\frac{1}{2}$ per cent. In view of these facts, it does not seem clear that even over these roads, freight could be moved at a fair profit to the capital invested for a cost one-third lower than one cent per ton per mile.

In the following tables the same method of comparison is applied to other important roads, including all whose statistics are published, and whose business is large enough to justify low rates. Under the heading, "at one cent," is entered for each road the amount of

net earnings which would have been realized had the whole freight business been done at one cent per ton per mile, and had the other business of the road been what it actually was. Under "Cost of Road," is entered the actual sum stated to have been invested in excess of bonded indebtedness, when that is known. Only nine roads would, at the supposed rate, be able to pay six per cent. interest on their bonds; only one would pay six per cent. on its entire actual cost. In a second table similar estimates are given, at a supposed rate of 2 cents per ton per mile, for some western and southern roads doing a freight business of less than 100,000,000 tons one mile.

[See Table on next page.]

These data do not, it is true, fix the cost of transportation by rail, but they serve to show that even on the most prosperous roads it is in nearly all cases over one cent per ton per mile, including in cost of transportation a fair interest on the capital actually invested, and that it is more than two cents per ton per mile where the amount of business done does not reach a limit attained as yet by very few railroads. This fact becomes of the utmost importance, when we consider that a very small proportion of the products to be moved is grown directly upon the line of the great trunk roads, and that it is upon the smaller roads—those having a business insufficient to make rates lower than 2 cents remunerative—that by far the greater part of the grain must be moved either to the lakes or rivers, or to the main trunk railroads. The average cost of roads in the western States is now \$50,000 per mile, equipment included, upon which \$3,000 per mile is 6 per cent. interest. Even if the passenger traffic earns one-third of this sum; and in the western States, with their comparatively sparse population, it usually does not—there remain \$2,000 per mile to be earned by the freight traffic. The average proportion of operating expenses to receipts on western roads is 65.2 per cent.; \$2,000 per mile must therefore be about 35 per cent. of freight receipts, or the gross freight receipts must average about \$5,714 per mile to earn interest on capital. Hence, roads so circumstanced having a business of 571,400 tons moved one mile for each mile of road, may bear an average rate of one cent; roads having a business of about 380,000 tons moved one mile for each mile of road, may bear a rate of $1\frac{1}{2}$ cents, and roads having a business of 285,700 tons one mile for each mile operated, a rate of 2 cents. These rates depend upon an average cost of construction and operating, and serve, therefore, only as a general guide in judg-

RAILROADS.	Rate charged	Tons 1 mile.	Net Earn'gs.	At 1c. per ton per mile.	Bonds.	Cost road less bonds	Interest on Bonds	Earnings on Stock
New York Central.....	1.59	1,020,608,065	\$9,134,239.55	\$3,083,681.61	\$16,496,020	\$46,803,904	6 p. c.	4 $\frac{1}{2}$ p. c.
Erie.....	1.50	965,925,302	3,913,621.03	None.	26,395,000	.....	None.	None.
Pennsylvania.....	1.4163	1,190,052,974	8,247,852.18	3,291,491.00	35,072,309	53,271,937	6 p. c.	2 p. c.
N. J. Central.....	1.46	382,936,569	2,883,911.68	1,100,400.00	6,899,000	20,000,000	6 p. c.	3 $\frac{1}{2}$ p. c.
Phila. & Reading.....	1.68	606,777,842	4,833,299.72	689,932.00	28,336,430	34,236,175	2 $\frac{1}{2}$ p. c.	None.
Lake Shore & M. S.....	1.38	910,855,195	6,118,597.00	2,613,650.00	26,495,500	50,000,000	6 p. c.	2 p. c.
Pittsburgh, Ft. Wayne & Chicago ..	1.44	487,852,472	4,507,464.00	2,534,615.00	13,621,000	22,214,285	6 p. c.	7 $\frac{1}{2}$ p. c.
Pittsburgh, Cincinnati & St. Louis..	1.38	496,182,354	1,967,768.00	65,859.00	10,011,740	8,433,550	None.	None.
C. C. C. & Ind.....	1.34	256,313,274	1,379,525.00	502,658.00	3,005,000	14,991,275	6 p. c.	2 p. c.
Toledo & Wabash.....	1.48	288,710,810	1,628,181.00	203,279.00	17,683,000	17,000,000	1 p. c.	None.
Atlantic & Great Western.....	1.80	227,744,760	855,660.00	None.	.....	.....	None.	None.
U. Comp. of N. Y.....	2.55	127,818,174	2,261,060.00	275,878.00	.....	22,458,000	.....	1 p. c.
Indianapolis & St. Louis.....	1.54	99,581,431	739,237.00	183,975.00	3,338,000	600,000	6 p. c.	3 p. c.
Chicago, Burlington & Quincy.....	2.10	240,856,973	2,836,865.00	None.	5,278,750	18,649,910	None.	None.
Chicago, Rock Island & Pacific.....	2.49	168,764,688	3,171,595.00	645,811.00	8,698,000	18,990,000	6 p. c.	6 $\frac{1}{2}$ of 1 p.c.
Ohio & Mississippi.....	2.01	107,684,078	1,057,771.00	None.	10,111,850	24,000,000	None.	None.
Illinois Central.....	2.10	272,290,900	3,179,899.00	37,194.00	8,390,500	35,878,644	None.	None.
Chicago & Northwestern.....	2.61	287,764,006	4,703,214.00	59,579.00	20,474,000	17,987,048	None.	None.
Michigan Central.....	1.56	.....	1,993,609.00	80,536.00	6,200,000	.....	None.	None.
Detroit & Milwaukee.....	2.38	33,239,325	442,155.00	None.	7,156,387	2,517,163	None.	None.
N. T. N. H. & H.....	3.74	38,662,529	1,769,809.00	710,482.00	1,641,500	15,500,000	6 p. c.	4 $\frac{1}{2}$ p. c.
Northern Central.....	1.67	198,888,911	1,161,769.00	None.	.....	.....	None.	None.
Boston & Albany.....	2.01	290,064,965	2,362,614.00	None.	.....	.....	None.	None.

RAILROADS.		Charge.	Tons 1 Mile	Net Ear'gs.	Net Incr. at 2c. per ton per mile.	Bonds.	Cost of road, less bonds.	Interest on Bids.	Earnings on Stock.
Missouri, Kansas & Texas.....	4.50	34,512,447	\$ 940,660.73	\$ 38,000.00	\$16,596,000.00	\$16,945,000.00	None.	None.	None.
Kansas Pacific.....	3.17	72,366,337	1,494,447.00	647,475.00	27,108,350.00	9,698,950.00	None.	None.	None.
Des Moines Valley.....	2.52	21,384,803	127,223.00	11,844.00	.....	13,893,283.00	None.	None.	None.
Atlantic and Pacific.....	3.74	80,297,618	2,065,568.00	668,203.00	27,400,000.00	23,400,000.00	None.	None.	None.
Hamilton & St. Joseph.....	2.16	67,728,662	670,529.00	559,586.00	9,146,900.00	14,250,828.00	6 per ct.	None.	None.
St. Louis & Iron Mountain.....	2.44	68,528,952	687,659.00	384,540.00	5,461,000.00	10,000,000.00	6 per ct.	None.	None.
Western & Atlantic.....	2.20	55,371,160	449,558.00	304,137.00	This road pays to State rental of \$300,000 yearly.	.....	.....	.....	.....
Mobile & Ohio.....	3.66	57,062,866	1,922,288.00	73,864.00	10,839,144.00	4,466,475.00	.....	None.	None.
A. Miss. & Ohio.....	2.57	53,129,661	734,327.00	428,897.00	10,889,842.00	6,921,900.00	.....	None.	None.
Detroit & Milwaukee.....	2.38	33,239,235	442,155.00	313,512.00	7,156,387.00	2,517,140.00	Short.	None.	None.

ing of possible reductions of rates, but they approximate to the actual results shown in the preceding table. Thus, it appears that even upon the chief trunk roads of the West the necessary average cost is over $1\frac{1}{2}$ cents, and upon the great number of roads over 2 cents per ton per mile. Also, it will be realized that the local traffic, being actually more costly than the through carriage, must pay rates somewhat above these averages, unless the through business is charged more than its real cost in order to carry the local business at less than its cost. The necessary cost of moving grain to the lakes, even when the local rates are put as low as possible, becomes a very important element in the relative cost of the all-rail and the lake and canal transportation.

No conceivable law, based upon the average quantity of business done for a series of years by any road, can so reduce its charges as to yield only a fair revenue in years of large traffic, or, if made applicable to more roads than one, can so reduce the charges upon the most prosperous without driving the others into bankruptcy. The actual cost of transportation diminishes as the quantity transported increases. An elaborate paper by Gen. Haupt, in the *Railroad and Mining Register*, based upon the statistics of the Pennsylvania Central estimates the cost of increased tonnage at $\frac{6}{100}$ of one cent per mile, and observes that this increase of cost for increased tonnage remains nearly the same—between 6 and 8 mills per ton per mile—upon smaller roads on which the present cost is two or three cents per ton per mile. On this principle, a road having in ordinary times a business of 262,000 tons carried one mile for each mile operated, on which the cost was 2 cents, if in a year of large crops its traffic should double, would carry the increased tonnage at a cost of only \$1,729.20 per mile, and the whole business at a cost of only \$6,969.20 per mile, and, charging 2 cents, would receive \$10,480 per mile for freight traffic—a clear profit, in excess of 6 per cent interest on its cost, of \$3,510 per mile, so that instead of 6 per cent, it would earn thirteen per cent. As there is no possibility of devising a law to anticipate fluctuations in the quantity of business done by any road, no conceivable law can so regulate its charges that in some years they may not be unreasonably high. If this difficulty exists in a law applicable to one road only—and no legislature will undertake to frame a different law for each railroad in a State—it becomes immeasurably greater when the law applies to classes of roads. In Illinois, for example, if the Chicago & Northwestern and Chicago & Rock Island, Chicago & Burlington and the Illinois Central were placed in the same class, the rate prescribed

should be high enough to afford a living income to the Northwestern, with 208,000 tons carried over each mile; now 2 cents per ton per mile, yielding a net revenue of \$2,937,219 (passenger business remaining the same), would pay interest on bonds, but fall \$400,000 short of 6 per cent. on cost. Yet, at the same rate the Chicago & Burlington would yield over twelve per cent. after paying 6 per cent. interest on its bonds. Or, if the rate were placed low enough to yield only 6 per cent profit to the latter road, it would drive the Chicago & Northwestern out of existence, if two years of short crops should happen. But these illustrations only bring to light the general truth that, of two competing roads anywhere, one will always have some advantage in length, cost of construction, cost of operating, or volume of business, and that the rate which will reduce the earnings of one of them to 6 per cent. will render the other unprofitable. The natural competition between roads already regulates their charges in some measure, and, beyond the prevention of discriminations for the purpose of forcing traffic out of natural channels, it will be at least difficult for any legislative body, not endowed with more than human wisdom and prevision, to frame a law just to all roads and equal in its protection to all producers and shippers.

It may safely be concluded, therefore, that no exercise of legislative power will reduce charges for freight from the farms to the lakes or rivers to an average rate as low as two cents per ton per mile, while the through rate to the east by rail is even now often as low as one cent per ton per mile. As the center of agricultural production moves further westward, the route by rail must constantly gain in advantage over the route by lake, in consequence of the higher relative cost of reaching the lakes, and that advantage is already decisive.

It may also be concluded that neither by exercise of legislative power, nor by the construction of through freight railways, can the cost of through transportation by rail be reduced below a yearly average of 1 cent per ton per mile, as long as the construction and operating of railways remain as costly as they are now. Measures by which the cost of construction and operating may ultimately be reduced, it is not deemed appropriate here to discuss. The average rate for the year 1871, even from Chicago, was 52.61 per 100 lbs., or \$10.52 per ton, and 1.17 per ton per mile, although in that year there were 106 days when the rate was below 1 cent, and the competing lake and canal rates were lower than they have been since 1859, in any other year except one. Had the through eastward

freight alone on the Erie been carried that year at an average of 1 cent, instead of 1.17 from Chicago, the earnings of that road would have fallen short of the interest on its bonds by \$275,000, so closely does competition already push the weaker of the great trunk lines to the verge of actual cost of transportation. Nor could private capital be found to undertake the construction of a new railroad a thousand miles long, with no prospect of earning beyond six per cent.

A new freight railway to the Atlantic coast, in order to compete successfully with routes already in existence, must have a double track and full equipment from the start, costing not less than \$75,000 per mile. If built by Government, it ought to earn interest on the debt required to construct it, and the officially published accounts of the cost of operating railways by the different governments show that on lines so operated the running expenses are higher than on roads belonging to private companies, in Germany $4\frac{1}{2}$ per cent., and in other countries $6\frac{1}{2}$ per cent of gross earnings. If built by private capital, a larger return than six per cent. will be expected and exacted. It must, therefore, earn, having no passenger business, at least \$4,500 per mile. To do so, at a rate of one cent per ton per mile, if its average cost of transportation are no greater than that on the Pennsylvania Central, it must have a business of four million tons over each mile, or four thousand million tons one mile; if its average cost were no greater than the lowest rate known in this country, in the transportation of coal alone on the Philadelphia and Reading, it must have a business of over two thousand million tons one mile, and if it could transport at the cost stated by Mr. Shinn, it must still have a business of 1,500,000,000 tons one mile, charging one cent per ton per mile, in order to earn only six per cent of its cost. As no road in the country has so large a traffic, and the new road would be forced to offer lower rates than the present summer average in order to draw business from others, it may fairly be questioned whether it could exist without a traffic more than thrice as great as any railroad now enjoys. But all the existing trunk roads would be hostile to it, and the multitude of Western roads leased, controlled or managed by them, would be conducted as far as possible to prevent freight reaching the new route. Having no feeders and branches of its own, while each trunk road has many, how could it secure a business more than thrice as great as either of them has attained? In brief, a yearly average of one cent per ton per mile must at present be accepted as the minimum below which through rates by rail cannot be expected to be re-

duced. Railway transportation has its limitations. It can perform wonders, but there are some things which it cannot perform. Sharp competition, either between railroad and water routes, will doubtless, in the future, as it has hitherto, push rates during certain months close to the limit of the actual cost upon the weaker of the great trunk lines necessary to supply adequate facilities. If rates could be sustained below that limit, one or more lines would be forced out of competition, and the facilities of others would become so inadequate that rates must instantly rise again. Hence, the only practicable measure of permanent relief is the opening of such channels of water communication as shall be unlimited in capacity, shall extend the period of competition through a larger part of the year, and shall be more accessible than the existing water routes to the present and future center of agricultural production.

APPENDIX E.

PROPOSED ROUTES TO THE SEA.

Projects for the relief of existing deficiencies in transportation by means of water routes, in order to meet the pressing demands of a commerce rapidly increasing, and already exceeding the capacity of present routes, must satisfactorily pass tests; first, as to the time required to obtain relief by the proposed method; second, as to the adaptation of the proposed route to the ascertained location of the products to be moved; and, third, as to the reduction to be effected in cost of transportation from the location thus defined to the chief markets of our own and other countries. On the map opposite page 29 will be found tracings showing the location of proposed routes or improvements, and their relative adaptation to the surplus of corn; another map on page 135 shows at a glance the localities from which the surplus of each of the chief products of agriculture is mainly drawn.

THE ATLANTIC AND GREAT WESTERN.

The project for connecting the waters of the Tennessee, Coosa, Etowa, Ocmulgee and Altamaha rivers satisfies neither of these tests.

It contemplates a system of improvements in the navigation of streams in which the channel cannot be deepened by dredging or by dams, but in many places must be excavated, the bottom being of rock. It contemplates the construction of canals through an exceedingly difficult region, with immense reservoirs to supply water, with a tunnel 3,200 feet in length, which alone would require years for its completion, and extending in the aggregate 365 miles. Long before such a work can be completed, however feasible or desirable it may be, the commerce of the west will of sheer necessity find and adapt itself to some other channel.

This plan does not reach the location from which the great bulk of western surplus products must be moved. In order to enable it to become of any service in the States west of the Mississippi, or near its source, that river must be improved above the mouth of the Ohio quite as much as it must be to render its natural channel a complete and permanent relief to western commerce. The great corn-growing region of Illinois is farther by rail from Paducah, the starting-point of the proposed route, than from Chicago. Whatever improvements are necessary to make the Mississippi available to the inhabitants of the Ohio Valley, must equally be made in the channel of the Ohio before the proposed route could be serviceable to them. Thus, after requiring all the improvements in the Ohio and the Mississippi, above the junction of the two rivers, which are needful to render them cheap and reliable routes for commerce, this project would expend over forty millions of dollars in cutting a new river across the country from Cairo, instead of less than eight millions in removing obstructions in the channel, and at the mouth of the great river which Nature has given us. It may be added that this route ends at no harbor, but must be extended along the coast to Brunswick or Savannah; that it is not yet certainly ascertained to be practicable—for the report of the Engineer Department (May 25, 1872,) expressly states that no work should be undertaken upon the vital portion of the route until it has been ascertained whether a sufficient supply of water can be had for the canal in the dry season (p. 516 War Department, Part 2, 1872-3); that throughout its length this route will be liable to interruption for lack of water during four months, July to October inclusive, and thus during the very season in which the western crops must be moved; and that at its best it can by no possibility be adapted to boats of greater draft than 3 feet in that season, and $4\frac{1}{2}$ feet at other times. Inasmuch as this depth long ago proved insufficient for economical transportation on the Erie and other canals, and the Engineer's report states, (p. 511 War Department, as above,) that "the narrowness and crookedness of the rocky valleys through which this canal must pass render it impracticable, except at a cost out of all proportion to the advantages to be gained by its accomplishment" to make the canal even deep enough to permit the passage of the light-draft vessels on the Tennessee river—six feet—it may safely be concluded that no relief for the agricultural products of the West can be expected by this method.

THE JAMES RIVER AND KANAWHA.

A plan having much greater promise, looked upon by Washington himself with favor, and strongly urged by many practical business

men, and some commercial bodies, is the James River & Kanawha Canal. By this Exchange, earnestly seeking, as so many commercial bodies have recently sought, relief from any quarter for the blockade of western commerce, this project has been regarded, prior to the present inquiry concerning the location of the surplus products of the West, as one of these from which general benefits to the producers of this section might reasonably be hoped. But this inquiry brings into prominence a vital fact, hitherto not at all appreciated in discussions of this problem, namely, that the agricultural surplus of the Northwest has now moved so far to the westward that, unless it can be economically transported by way of the Mississippi river, it will inevitably be transported mainly by rail. When Washington contemplated the necessity of this improvement, "the West" was near Pittsburgh and Marietta. In 1836, when the construction of the canal from Richmond to Lynchburg was commenced, the population and the products of the States of Ohio and Michigan were less than those of the State of Missouri alone are now, and the population of Illinois was less than the present population of the City of St. Louis. In 1856, when the work was suspended, the surplus of wheat available for shipment from States west of the Mississippi River was not more than five million bushels, or 150,000 tons; it is now more than forty-seven million bushels, or 1,410,000 tons. As long as the greater part of the surplus products of the West came from Ohio, Indiana, and Eastern Illinois, water-routes to the eastward were naturally supposed to offer greater economy in the cost of transportation, than any which involved an expensive westward carriage before reaching the natural channel from the interior to the sea. But now that the greater part of that surplus must cross the Mississippi before it can commence an eastward journey, and, in order to reach either the lakes or the western terminus of the James River route, must pay a freight exceeding in the average 25 cents per 100 lbs., or more than the present average cost of reaching the sea at New Orleans, the conditions of the problem are entirely reversed.

It is claimed by the advocates of this route, that by means of it grain may be moved from the Ohio, at Point Pleasant, to the James River, at Richmond, for fourteen cents per bushel. Assuming, for the moment, that this claim is well founded, adding, for the present, nothing for the cost of transportation to a deep water harbor at Norfolk, and assuming that ocean freights from Norfolk would be as low as they now are from New York, while from New Orleans they are one-fourth higher, the cost of moving grain from the Ohio River to Liverpool would be thirty-four cents, or with one transfer at

Richmond thirty-six cents. But the cost of moving from the point of production to the mouth of the Kanawha must be added, and for more than two-thirds of the grain surplus the cheapest possible route would be to the Mississippi and to Cairo, and thence against the current of the Ohio to Point Pleasant. The actual rate for transportation up the Ohio in barges to that point is five dollars a ton, or twenty-five cents per 100 pounds, and fifteen cents per bushel, which, with transfer at the entrance of the proposed route, would make fifty-three cents. Grain is now moved to Liverpool, at all seasons of the year from Cairo, and whenever the river is open from St. Louis, even at low water rates, for less than fifty cents per bushel. The benefits of the proposed route could, therefore, extend only to such grain as is produced for shipment in southern Ohio and Indiana—less than twenty million bushels out of two hundred and fifty million bushels. Examination of other facts will show, moreover, that even to this portion of the crop the southward journey with the river current would be made, by moderate improvements, the cheaper of the two. Thus the radical defect of the James River and Kanawha plan is that it does not reach the region from which the western products are chiefly to be moved. To the actual necessities of the country, it is as inapplicable as it would be to the movement of iron ore from Lake Superior. Grain from the Mississippi valley, for export, would have to pass by a route already cheaper, and capable of great improvement, in order to reach the starting point of this canal; grain for consumption in eastern States would be delivered at a point on the seaboard where there are no consumers, and distant three and five hundred miles in an air line from the chief markets for consumption in the East.

Nevertheless, this project has so many local advantages in its favor, has been so warmly commended in quarters entitled to high consideration, and has in many minds been regarded as promising so much of relief for the over-crowded commerce of the west, that it deserves a somewhat more critical examination. It would open to commerce a region rich in ore, coal and timber. It would build up a State dear to all who read with reverence and affection the early history of our country. It would unquestionably bring a new supply of coal to the consumers of Cincinnati and the adjacent region, would stimulate the manufactures of that thriving city and the industries of southern Ohio; and if, in addition to these great local benefits, it would serve in any measure to relieve the necessities of the chief surplus-producing States of the West, it would deserve to be regarded as a measure of national importance.

Briefly stated, the project is to enlarge the present canal from Richmond to Buchanan, Virginia; to construct a canal over the Greenbrier River, and to adapt that river and the New River by dams and locks for slack-water navigation, and the Kanawha, by low dams and sluices, for navigation to the Ohio at Point Pleasant. The length of the route, as shown in the official report of Major Craig-hill to the Chief Engineers, transmitted to Congress, February 9th, 1871, by the Secretary of War, with the character of navigation, number of locks or dams, and estimated cost of necessary improvements on each section, are as follows:

ROUTE.	CHARACTER OF NAVIGATION.	DEPTH OR TONNAGE	LENGTH IN MILES.	NO. OF LOCKS OR DAMS.	RISE OR FALL.	TUNNELS	ESTIMATED COST OF WORK TO BE DONE.
Norfolk to Richmond.....	open river	1000 tons.	151	.....	.....	.....	Dredging from City Point, 36m.
Richmond connection.....	Canal.	16 feet.	1	6	84	.....
Richmond to Lynchburg ..	"	16 feet.	146.50	52	4.9	.....	\$1,634,937
Lynchburg to Buchanan ..	"	7 feet.	50	37	2.9	.....	4,811,336
Buchanan to Covington....	"	"	47.27	38	43.2	22,098 ft	2,092,008
Covington to Fork Run....	"	"	17.17	35	37.6	.....	4,037,577
Fork Run to Tunnel	"	"	7.80	6	72	.....	2,206,795
Tunnel	"	"	4.66	3	.....	40,380	.....
Tunnel to Greenbrier River	"	"	.....	30	.....	.....	13,255,310
Greenbrier river	slack wa'r	"	49.586	19	316	.....	2,383,474
New River	"	"	67.433	55	75.6	.....	.....
Kanawha	Sluice.	"	85.100	.....	75	.....	13,243,541
By open river		1000 tons.	151.	.....	.....	.....	973,900
By sluice navigation.....			85.1	.....	.....	.....	[tance.
By slackwater navigation.		7 feet.	124.22	+74 locks=	198.2 miles	equated dis-	
By canal navigation.....		7 feet.	274.6	+177 "	=451.6 miles	canal navi-	
			614.9			[gation for equation.	

The proposed depth of this canal is the same as that of the Erie. Of the possibility of greater depth, the engineer's report says: "Any considerable enlargement of scale will increase the cost in the rapidly ascending ratio; the water supply would become more uncertain or expensive." Moreover, examination of the history of the Erie has led to doubts whether the reduction in cost of transportation arising from the capacity to move larger cargoes have not been more than balanced by the increase in cost occasioned by greater delay in haulage and in filling the larger locks. Hence, we may conclude that the canal will not be constructed of greater capacity than the Erie, and that the ascertained cost of transportation on the Erie, after many years of sharp competition between that canal and the railroads, will justly measure the cost of transportation in proportion to distance on the proposed canal.

What is its length? From tide water at Richmond to slack water on the Greenbrier, the latest survey makes the length 274.6 miles, and the number of locks 177. The most distinguished engineers consider that each lock in canals of that size is equal in cost of

transportation to one mile of distance, and the observations for years on the Erie justify the estimate. But the Erie canal is 350 miles long, and has 72 locks; the greater number of locks on the proposed canal is equal to 105 miles of distance, which, added to 274.6 miles, gives an equaled length of 379.6 miles for the James River and Kanawha against 350 for the Erie, 72 locks in each being canceled, or, in all, 451.6 miles against 422 miles equaled distance. It is necessary to conclude that the cost of transportation from the Greenbrier to Richmond will at least be no less than the cost for the shorter distance from Buffalo to Albany. The river navigation from Albany to New York is 150 miles, and the chief engineer of the James River canal states the distance by river from Richmond to the mouth of the James as 151 miles. Thus, from Greenbrier to the sea and from Buffalo to the sea the distances by canal and river are nearly equal, with a slight advantage in favor of the Erie. Now, the rates on the Erie have been examined, and the average for the last year was 13.1 cents per bushel of wheat, and for the last three years it varied from 10 cents in May to 14 $\frac{2}{3}$ cents in November (see tables, p. 52.) Hence we are forced to the conclusion that the cost from the Greenbrier to the sea would be at least 10 cents in the spring, rising to 12 and 14 cents when the movement of the crops should begin.

If it be argued that competition between those two water routes would reduce the rates, the simple answer, furnished by the facts already examined is, that competition from the railroads and the Welland and St. Lawrence route has already deprived the Erie of a large part of its grain trade, and yet has not reduced the rates. If it be argued that a part of the cost on the Erie is paid in tolls to the State, the answer is furnished by the cost of the proposed route, as estimated by the engineers who recommend it, for whether built by private enterprise, by a State, or by the government, the canal must pay the cost of its maintenance, and interest on the sum expended in its construction. Six per cent. interest on the cost is \$2,880,000, and the estimated expense of maintenance is \$387,000 yearly; total, \$3,267,000. The tonnage cannot be expected to be as large as that of the Erie, for the latter passes through a rich and well settled country, and has New York city at one terminus and the great lakes at the other; but the entire tonnage of the Erie in 1872, was only 3,562,560 tons, of which only 1,889,473 tons were shipped from its western, and only 804,233 tons from its eastern termini, so that the quantity of through freight was very much less. Manifestly, to realize the sum estimated by the engineers, the proposed canal must

charge at least one dollar per ton toll on through freight, or 3 cents per bushel, and the Erie charges only $3\frac{1}{10}$ cents per bushel. But the estimate for cost of maintenance will not bear scrutiny. The actual cost of only ordinary repairs on the Erie was \$545,276; the pay of superintendents \$424,766; the pay of toll collectors \$55,036, and the salaries of weigh masters \$12,285; so that the cost of running the Erie in 1872 was \$1,037,353, and that exclusive of extraordinary repairs, \$634,936, and employment of clerks and miscellaneous expenses in the general office. The James River would be as likely as any other canal to need extraordinary repairs, especially as the engineers report that the floods on the streams in that region are extraordinarily severe on the New River, rising in one instance, sixty-nine feet. But entering only the ordinary repairs and expenses on the Erie, and the interest on the cost of the James River and Kanawha, it appears that the latter must earn at least \$3,917,353 yearly, which, with a tonnage equivalent to the entire tonnage of the Erie, carried the whole length of the proposed canal, would require tolls of \$1.10 per ton, or more than the charge on the Erie.

Thus, there is no reasonable escape from the conclusion that the average cost of transportation from the Greenbrier River to the sea by the proposed canal, would be as great as the present cost on the Erie and Hudson. But in reaching the canal, freight coming from the west must traverse, after leaving the Kanawha at the shoals—which now arrest navigation—124.2 miles of stream, confined by seventy-four locks and dams. The cost of transportation on such a stream cannot be estimated, for it would become at times unnavigable by reason of the extraordinary floods just mentioned, and at all times would involve the delay and consequent expense of passing frequent locks. If the delay is equivalent to one mile per lock, where boats are drawn by horse power, and average eleven days from Buffalo to Albany, or one and one-third miles per hour, it must be at least three times as expensive to steamers towing barges, and averaging at least four miles an hour. If so, the seventy-four locks on these streams would be equivalent to 222 additional miles of distance, making the cost equal to 346 miles of open river navigation. Actual charges elsewhere supply no test of the cost of transportation over a stream so peculiar in character, having a fall of 1,072 feet within 116 miles. Of this stream, Mr. Ellet, in his work on the Ohio and its tributaries, says (p. 241):

“But in the vicinity of the falls the character of this river suddenly changes. The profile here mounts up with a quick ascent, which renders idle all expectation of stemming the current. The

stream becomes, in fact, a succession of rapids falling through 362 feet in a space of $27\frac{3}{10}$ miles, which is about twenty-seven times as much as the Ohio falls in the corresponding part of its course. It is, in fact, more than the descent of Niagara river from Lake Erie to Lake Ontario, which, in the same space of about 27 miles, passes over the falls, and descends through rapids almost as sublime as the cataract itself."

It is by no means intended to challenge the opinion of the engineers who recently pronounced it practicable to render this stream navigable, though their report states that the floods are such that "the locks will of course be submerged." But the character of the stream, and the frequency of the locks required to make it navigable at all, and the uncertainty of navigation arising from the liability to dangerous floods, must affect the cost of transportation materially. Supposing, however, that it would be no greater than the cost of the equated distance of open river navigation, not with a current, we have 346 miles. Eighty-five miles remain on the Kanawha, and of the sluices here proposed, the official report of the engineer says: "The resistance to a tow of loaded boats passing these sluices *up stream* will be greater than has been supposed, for the tow will completely fill the sluice, and will require some modifications of the present method of towing. * * In case the system of towing cannot be changed to occupy less width than is now usual (I see no reason why it should not be), then recourse must be had to locks and dams.' But if those difficulties were overcome, and the up-river navigation, from the mouth of the Kanawha to the canal, rendered not more costly than the equated distance, or 431 miles of open navigation without current favoring, what would be the cost? The lowest rate at which grain is now moved a like distance, in barges on the Upper Mississippi or Illinois, even with the current and ample water in the spring, and in times of the sharpest competition, is from six to seven cents per bushel. It seems not reasonable to expect that lower rates will be obtained where navigation is so obstructed and uncertain, and where no current favors. But at this rate transportation from the Ohio at Point Pleasant to the ocean at Norfolk would cost, with two cents for a transfer at some point from the barges into canal-boats, from eighteen cents in May, to twenty-two cents in November—if the route should be open at all in the fall. For, behind all other objections lies the grave one, which is also thus stated in the report of the engineer who examined the route (p. 25, ex. 110, 1870-1): "Considering that this water-line will be closed at its junction with the Ohio, for about three months in each year, by low water in that stream, I was at first disposed to recommend the improvement of

the rivers to a less depth than that adopted for them, but there is no reason why the capacity of the line should not be kept up during such periods as furnish sufficient water." Now the period of low water in the Ohio is precisely the period at which this canal must be most actively employed, if it is to give any relief to the crowding agricultural products of the West. In order to render it serviceable, in other than a local view, the Ohio River must also be so improved as to secure an ample depth at the lowest stage. But this improvement, necessary as it is, would at once so cheapen transportation with the current southward, that the rate now attained with a full supply of water—seven cents per bushel of coal to New Orleans—could be nearly attained with barges adapted to the movement of grain. And thus the completion of the Kanawha route, so far as to render it at all serviceable to the western States, would, at the same time, open to the farmers of Ohio a route by way of the river and the gulf and ocean, by which the movement of wheat would cost not more than eight cents to New Orleans, two cents for transfer there, and ten cents thence to New York—less than the cost of moving grain in any season of the year from Point Pleasant to Norfolk, and thence to New York. If even to them this route, when completed at a cost of forty-eight millions besides the necessary improvements of the Ohio, would bring no lower rate than the improvement of the Ohio alone would offer, what advantage could it give to producers farther westward.

In the many elaborate statements which have been made in behalf of this route, one very remarkable error occurs repeatedly. The cost of transportation against the current of the Ohio is stated as averaging three mills per ton per mile. The lowest rate known to have been reached descending the Ohio is in the transportation of coal—not much exceeding one mill per ton per mile; while the lowest rate known to have been reached, at any time, or in the movement of any kind of freight, ascending that stream, has been in the shipment of enormous quantities of iron ore in barges from St. Louis to Pittsburg, or points on the river above Cincinnati. At times a single company has shipped three thousand tons of ore daily, and the competition between transporters has, in one case, pushed the rate as low as \$3.50 to Pittsburg; but the ordinary rate varies from \$5.00 to \$6.50 per ton—rates for 975 miles (counting only the up-river distance from Cairo), equivalent to 3.6 mills, 5.1 mills and 6.6 mills per ton per mile respectively. The remarkable difference in minimum rates attained finds a perfectly natural explanation in the retarding effect of the current upon loaded vessels

going upward, either in times of flood, when the velocity of the stream equals, and often exceeds, five miles an hour, or, in time of low or moderate water, when loaded boats reach so near the bottom, and so nearly block the channel, as to meet with great resistance from the current. No conceivable improvement can make transportation against the current as cheap as transportation with a current which reduces to a minimum the expenditure of fuel and power required. Floating with the current, power is scarcely required, except to steer the barges, and since the maximum velocity of a river current is three-tenths of its depth below the surface, barges loaded to that depth only receive the greater aid from the stream itself. But for the same reason, loaded barges moving against the stream encounter a resistance more than proportioned to their depth of submersion, and when the depth and width of the tow are such as to nearly fill and dam the channel, the resistance can be overcome only at great expenditure of power. These principles, obvious as they seem, and evidently governing the cost of transportation upon every stream having considerable velocity, are of the highest importance in the consideration of any plans which involve navigation with heavy loads against the current of such streams. Yet they are wholly overlooked or ignored in the published estimates of advocates of the Kanawha, and some other routes. In all problems concerning the method of transporting the surplus products of the Mississippi Valley, it must be remembered that the freight *from* the valley will always exceed in bulk, by three or four times, the freight *to* the valley. The proportion on the Erie Canal is about ten eastward to one ton of westward freight; on the lakes about three tons of eastward to one ton of westward freight; on the railroads about three tons of eastward to one ton of westward freight. It is claimed, but erroneously, that the Kanawha route will be an exception, because of the movement of coal to Cincinnati; practically, it will not be, because the grain and other products of the Mississippi Valley cannot be moved in the same barges, in which coal will be most economically brought down from the mountains. Thus, for this route, as for any other, the outward, or eastward, freight in barges or boats of the ordinary character will be at least three times as heavy as the westward, and upon this route it happens that the transportation of the three tons out of four must be against the current for 714 miles on the Ohio (from Cairo to the mouth of the Kanawha), and 209 miles on the Kanawha, New and Greenbrier rivers, while the transportation of only one ton out of four will be with the current. Under these circumstances, no lower rate for freight eastward can be expected than has actually

been reached, in times when there is abundant water and sharp competition, and in the movement of a kind of freight transported quite as cheaply as grain, namely, iron ore. The present rate is \$6.50 per ton to Pittsburgh, and \$5.00 to the mouth of the Kanawha; the lowest ever reached was \$3.50 to Pittsburgh, or \$2.70 to the mouth of the Kanawha, which is equivalent to 8.1 cents per bushel for wheat. At the same time, coal is now moved from Pittsburgh to New Orleans, with the current, for \$2.50 per ton, or 7.5 cents per sixty pounds, though the distance up stream is only 714 miles, and the distance down the river, from Pittsburgh to New Orleans, is 1,951 miles. The contrast shows forcibly the difference in cost between transportation with, and transportation against the natural current.

If the lowest rate which can be called practicable by river and canal from Cairo to New York is 8.1 cents to the Kanawha, and (in the best month) eighteen cents thence by canal, while in the same month the average rate by lake and canal from Chicago to New York is eighteen cents, and the Kanawha would be closed by want of water in the Ohio during August, September and October, the very months in which the crops are hurried forward to market, the relief which may be looked for from this projected route is not very great.

WISCONSIN AND FOX RIVERS.

We have next to consider proposed methods of reaching the lakes from the Mississippi. To all these projects one objection applies, namely, that they contemplate only the prolongation westward of a route (by lake and canal) which is already losing rapidly the traffic which it formerly possessed. The lake and canal form a channel which already overflows because its eastern outlet is utterly insufficient, and to increase the flow of traffic into that channel would be useless, and would only increase the overflow, unless some means of enlarging its outlet could be found. Moreover, the clogging of the outlet, as we have seen, is not simply a difficulty of capacity, for the Erie canal and the Welland can both move more grain than they now receive, but partly of cost. No improvements from the river to the lakes would lessen the risks of lake navigation, or prevent the closing of the route by frosts before the surplus of western crops could be moved, or equalize the movement of freight so that boats on the lake and the canal being more steadily employed, their necessary charges in the season of activity might be lower than they are now. Indeed, extension of water routes westward, if it should bring no larger quantity of grain to the lakes than now reaches them,

would prove a failure; whereas, if it should increase the quantity seeking transportation by that route, it would only operate to make the demand still more exceed the capacity of the route in the busy season, and so lead to still higher charges. Hence, no canals from the river to the lakes can give relief until the existing obstacles to success of the route by lake and canal from Chicago or Milwaukee eastward can be removed.

The Wisconsin and Fox rivers, the one emptying into the Mississippi at Prairie Du Chien, and the other into the lake at Green Bay, have been connected at Portage City by a canal, but the route is as yet of no practical utility in a general sense. To make it of avail, the channels of the rivers must be so improved as to permit boats of a greater depth to pass. The existing locks on the Fox river (22 in number) are of only five feet depth, but the Engineers report that they can be enlarged. But as to the Wisconsin river, the practicability of proposed improvements has yet to be determined by the operations now in progress, as the report of the engineer in charge states. Moreover, the following extract from the report of Major Houston, in 1872, shows that no greater depth than six feet is deemed possible:

"In regard to the depth of the locks, it seems to be well settled that the maximum draft for vessels on this route is six feet. Those who have not investigated the matter have supposed that the route might be so improved that the lake steamers could pass through to the Mississippi, and transshipment be thus avoided.

"The improvement of these rivers for such a purpose is impracticable. A ship canal might be made which would allow this, but to make it available it would have to be extended up and down the Mississippi. The enormous cost of such a work is such that the engineers have not considered it, nor has the government indicated any intention of undertaking such an enterprise. All that the government proposes is to improve the natural navigation of those rivers to their maximum capacity by slack-water navigation on the Fox, and by the method above-mentioned on the Wisconsin. It is believed a six-foot navigation is the maximum that can be obtained. Many of the present locks will allow this, and all of the new ones will be so arranged."

The length of the proposed route is 278 miles, with 22 locks on the Fox river portion, and it is stated that 38 locks are contemplated in the proposed canal from Portage City to Prairie du Chien, which General Warren recommended as "the most practicable plan for obtaining a reliable navigation from Green Bay to the Mississippi river." In effect, then, the contemplated route would be a canal $\frac{1}{4}$ or 78 per cent. the length of the Erie, with about sixty locks, while the Erie has seventy-two, but of only six feet depth

while the Erie has seven. Its locks, however, would be 35 feet wide and 160 feet long.

This route in part meets the second of the requirements mentioned already; it reaches a region from which a large quantity of the surplus of wheat and oats must be moved. It does not reach the greater part of Iowa, however, nor would the immense supplies of wheat and corn from the central and lower part of that State and Illinois be transported economically against the current as far northward as Prairie du Chien, and thence by canal to the lake. Regarding its practical utility as a measure of national relief, moreover, grave questions remain. The cost of transportation by such a canal may fairly be expected to be quite as high as upon the Erie. With very much less local traffic, it would be much more dependent upon a business confined to three months in the year. Indeed, as the wheat crop of Minnesota does not begin to come forward in quantity until September 1st, while this route would be ill-adapted by its location to the movement either of the winter wheat of Missouri and central Illinois, or of the spring out-flow of corn from southern Iowa and Illinois, it would have practically but two months of full employment—September and October—for in November the risk of a stoppage of navigation by way of the Erie or St. Lawrence, reduces shipments by lake from Chicago to less than one-half a month's work. It is a matter of just doubt whether rates as low in proportion to distance could be maintained upon such a route as upon the Erie, where the employment is equivalent to five and one-half months in the year. Transporters would not find it profitable to employ more boats than could pass the locks without delay, and the capacity of the canal in that respect diminishes as the size of the locks increases.

But with rates no higher than the Erie in proportion to distance, the charge would still be 78 per cent. of 13 cents—the average fall rate on the Erie—namely, about ten cents. Now the railroads, in combination with barges on the upper river, have ordinarily carried for ten cents from the river to Chicago, and at one time of sharp competition for six cents. Accordingly, during two months the competing roads would put rates down to six cents—a rate apparently lower than would sustain the number of boats needed for a full traffic. Some of the transporters would retire; the number of boats would decrease, and, the quantity of grain to be moved being then largely in excess of the capacity of the canal, either those transporters who remain in the business would put up their rates in combination with the railroad companies, or the canal would be

gradually deprived of business, and of working force, one transporter after another abandoning it, until a condition like that of the Miami or Wabash Canal would result. Those canals formerly did a very large business, but, because in depth they are insufficient, as early as 1862 they delivered at Toledo only 217,860 barrels of flour and 3,750,000 bushels of grain, while the Toledo & Wabash and the Dayton & Michigan Railroads during the same year delivered at Toledo 405,646 barrels of flour and 6,685,952 bushels of grain, and since that time the usefulness of the canals has steadily diminished until, according to the testimony of Mr. Benj. Eggleston, before the Senate committee in session at Cincinnati last fall, upon the Miami "now there is not a ton of through freight." Is the conclusion suggested that no canal can compete with railways? By no means; but only that in order to compete successfully a canal must have either such an advantage in cost of transportation as to enable it to dictate rates, still securing to the transporters profit enough to prevent a decrease in their number and facilities, or a sufficient local business to support low rates independently of through traffic. By some it is apparently supposed that grain from Minnesota can be moved southward to Prairie du Chien (116 miles from Winona, and 266 miles from St. Paul) and thence in the same barges or boats through the Wisconsin and Fox River to the lake. But the river boats would find the passage through a canal of such length, and with sixty locks, each involving a delay of about half an hour, not by any means an advantageous employment of time. It costs so much per day to run these steamers that the delay is vital. During the week or ten days which would be consumed in a trip through the canal, a river steamer would run from St. Paul to Fulton, deliver her cargo to a railroad, and back to St. Paul. The barges used in the upper river move grain far more economically than it can be moved by steamers or separate canal boats, for from five to eight barges are moved by a single tug in the open river; but in the proposed canal such a movement of boats in fleets would be impossible, and an improvement of the stream by means of a system of locks and dams would equally render the use of fleets of barges impracticable, for a company operating on the river could not afford to spare its barges for employment so much less profitable.

Finally, Green Bay is not a great commercial city, with such a traffic as to secure return freights from the East to vessels going thither in preference to Chicago. It is at least possible that vessels would be lacking to move the grain from the canal, or that vessels, having less return cargoes than those running to Chicago, would be

compelled to charge higher rates eastward. But, with rates as low across the lakes, and with ample business, the cost of transportation from the Mississippi to the lake does not seem likely to be materially or permanently reduced by this canal, while the same obstacles to transportation by lake and canal eastward would remain. The proposed canal will be a great local benefit, and it may for a time contribute by competition to restrain railroad charges from Minnesota and parts of Wisconsin to the lakes. But it offers no sufficient or permanent remedy for existing evils, and, indeed, leaves wholly beyond the reach of any benefits it may confer, the producers of Ohio, Indiana, Illinois, Central and Southern Iowa, Nebraska, Kansas and Missouri.

THE ILLINOIS AND MICHIGAN CANAL.

An improvement of the Illinois River, by dredging, was commenced by the national Government, and, meanwhile, the construction of locks and dams upon the river was commenced by the State of Illinois. One or the other of these improvements is undesirable. The channel of that stream can be kept open, at less cost than that of only one of the dams now in progress, with three feet of water at the lowest stage from Henry to the mouth, and the current will then not only clear out the sediment, but give some aid to navigation, the heavy cargoes going southward. Or, on the other hand, a more expensive mode of navigation (by locks and dams) can be substituted at greater cost, and, the advantage of the current being denied to all, the cost of transportation will be as great in one direction as in the other. Whether the sediment of this comparatively sluggish stream will not soon fill up the channel in the pools, and render other and more costly works necessary is not yet entirely clear.

What should be done to aid navigation on the Illinois depends altogether on the determination of the Government in regard to opening the Mississippi as a free highway to the sea. If that measure is adopted as part of a national plan of relief, then the cheapest possible transportation to that highway, upon all its navigable tributaries, should be preserved, and whenever sufficient depth for barges can be maintained with an open stream and a free current in the direction of the heavier traffic, that mode should be preferred. On the other hand, if the Government determines not to make the Mississippi River a free highway from the interior to the sea, but to insist that our commerce shall as far as possible be forced into a route already over-crowded—by the lakes and the Erie canal or St. Lawrence—then as much should be done as possible to undo

what Nature has done, and to remove those natural currents which Nature designed to aid our commerce, but which prove only an obstacle if we resolve that our traffic shall run up-hill. In that event, the more bulky cargoes going northward, the system of stock and dams will secure for them the cheaper transportation; and, if there is not danger of filling up with sediment the pools formed by dams, that method should be preferred.

Contemplating for the present only the latter use of the Illinois River—its transformation into a canal, extending to the Mississippi the route by way of the lakes and the Erie, it is to be observed that the railroads already move freight into Chicago at as low a rate as the canal over that portion (from Peoria) which is now mostly confined by locks. If they can do so for one-half the length of the stream—since railway transportation costs less per ton per mile the greater the distance—they can do the same for the whole length of the river when improved. In 1872 the canal took to Chicago only 4,808 bushels of wheat, 7,157,274 bushels of corn, and 851,589 of oats. But the Chicago and Rock Island, running by the side of the canal as far as Peoria, took into Chicago 1,793,450 bushels of wheat, 7,627,698 of corn, and 2,152,896 of oats. The charge in summer, when the railroads carry at the same rate as the canal, is five cents a bushel from Hennepin to Chicago; the rate by rail when the canal is closed rises to thirteen cents. Thus the canal materially benefits the producers immediately adjacent to it, but only during the summer months; nor would the completion of slackwater navigation to the Mississippi, by a system of dams on the Illinois, make it possible to move grain from Iowa or Minnesota down the river to the mouth of the Illinois—a distance of from two to four hundred miles—and then by slackwater and canal to Chicago, a distance of three hundred and twenty-five miles, as cheaply as it is now moved from the Mississippi by railroads from Fulton, Dunleith and Burlington. As the improvement of the Wisconsin will, during the summer, secure lower rates to the lakes only for the producers of Wisconsin, near its banks, so the improvement of the Illinois would secure lower rates during the summer only to the producers of Illinois closely adjacent to it, and both together would leave the great body of producers in Central Illinois, and in all the States west of the river, as much dependent as they are now upon railroad facilities and rates. Insufficient, separately or together, as measures of national relief, improvements of these streams would be more valuable to the producers of Illinois and Wisconsin, in connection with an improvement of the Mississippi, than in connection with the

lakes and the Erie, because they would then secure low rates southward for two or three months in the year during which the lake route is closed.

All these projects leave without remedy the growing defects and deficiencies of the route by lake and canal. To shorten the route by lake, a canal across the State of Michigan and a canal from Georgian Bay to Toronto or Montreal have been proposed. Enlargement of the Welland and Erie Canals, a ship-canal from the St. Lawrence to the Champlain, and another around the falls of Niagara, on the American side, have been proposed to enlarge the eastward outlet of this route.

THE MICHIGAN CANAL.

The proposed canal across Michigan is advocated on the ground that it will shorten the distance from Chicago to Lake Erie, and avoid the very dangerous navigation of the upper lake region. The estimated length of canal required is about two hundred miles; its use would involve one transfer of cargo at its entrance, and another at Detroit, costing two cents per bushel each, and a cost of transportation certainly not less than half the cost from Buffalo to Albany, 350 miles; but if so, the shipment of grain through this canal alone would cost more than the entire average freight by present methods from Chicago to Buffalo.

GEORGIAN BAY AND ONTARIO CANAL.

The proposed canal from Georgian Bay to Toronto would be only one hundred miles in length, and effect a material saving in distance, were it not for the numerous locks required to overcome a rise and fall, stated at 605 feet—130 feet rise from Lake Huron to Lake Simcoe, and 475 feet fall thence to Lake Ontario. Sixty locks of ten feet each within only seventy-seven miles—the natural navigation through Lake Simcoe deducted from the whole length—would render the route a very expensive one. The Welland Canal, with only twenty-seven locks, and only twenty-eight miles long, requires twenty-four hours passage for a steamer, and forty-eight hours for a sailing vessel. At four miles an hour for steamers—a rate not to be exceeded on the canals—and a delay for lockage proportioned to that on the Welland, it would require at least sixty-four hours to pass through the Toronto ship canal and its locks, while the usual time from Chicago to Buffalo is only one hundred hours. Hence, the large lake vessels would find it not economical to use the proposed ship canal, for they could reach Buffalo in less time without, than Toronto with it. On

the other hand, the transfer into smaller boats at the mouth of the canal and again at Toronto, with the cost of towage through the canal, would involve an expense greater than the entire charge by present methods from Chicago to Buffalo. The lake navigation, with all its defects and dangers, may safely be pronounced the cheapest possible mode of transportation from upper lake ports to Buffalo, Oswego, or the St. Lawrence, and no projects for shortening the distance by means of canals, promise any reduction in the cost for that part of the route.

A NIAGARA SHIP CANAL

Does not seem to be necessary, or to promise any reduction in the cost of transportation. The Welland Canal already passes vessels drawing ten feet, and within four years it is expected that the enlargement will be completed, so that the canal will pass vessels of 1,000 tons, and have an estimated capacity yearly of 5,000,000 tons. But it is not believed that more than two-thirds of the capacity of this canal is employed, and until some method has been devised for moving a larger quantity of freight and at lower rates, from the Eastern terminus of Lake Ontario, more directly to the consumers in Eastern States, the contemplated enlargement of the Welland will afford all the facilities which the route *via* Lake Ontario can demand. Thus all plans of improvement upon the lake and canal route eastward, depend at last upon the success of the methods for moving freight in larger quantity and at cheaper rates, from Buffalo, Oswego, or the St. Lawrence. The blockade is chiefly at that end of the route, caused partly by the early closing of the canals by ice, partly by the insufficiency of the canals to move the quantity required during the short time after the crops have been gathered and before the season closes, and partly by the high charges for transportation, which seem to follow these conditions inevitably.

APPENDIX F.

MONTREAL GRASPING THE EXPORT TRADE.

To the most sagacious merchants of New York it is no new idea that Montreal will obtain complete mastery of the export trade in grain, unless, by methods not yet devised, grain can be moved to New York at a rate from five to twelve cents per bushel lower than the present rates from Chicago by lake, canal and the Hudson river. The case is briefly and clearly stated in the following extract from the elaborate report of the New York Produce Exchange for 1872 and 1873.

“The St. Lawrence route from the ocean to the lakes, for seven and a half months of the year, has no barrier to free natural navigation, except the sixty-nine miles of ship canal comprised in the twenty-eight miles of the Welland Canal, and the forty-one miles of ship canal around the rapids of the St. Lawrence. The St. Lawrence canals have now only nine feet of water on the mitre-sills, and their use has not been profitable or practicable for lake vessels drawing twelve or thirteen feet of water when fully laden. Hence, the grain from the upper lakes designed for Montreal is mostly transferred at Kingston, and is transferred from thence to Montreal by the Rideau Canal, 132 $\frac{1}{4}$ miles long, with five feet of water in the locks. The Welland Canal can now pass vessels of 450 tons measurement, but with only ten feet of water in the locks vessels are lightened at Port Colborne, and the portion (of cargo) taken off is transported by the Welland Railway to Port Dalhousie, and is there reladen upon the vessel from which taken. With these comparatively imperfect facilities, Montreal has increased her grain trade in a much greater ratio than New York.

“It is proposed to enlarge both the Welland and St. Lawrence canals for the passage of vessels of 1,000 tons. The Erie Canal, free of tolls, with the present mode of towing, *could not compete successfully with this improved route to the ocean*, and the city and State of New York, for seven months of the year, would, to a very large extent, be deprived of the trade of the northwestern States, including both exports and imports.”

Strong as this statement is, it does not show how largely Montreal has already gained upon New York in the grain traffic, nor how wide will be the difference in cost of transportation eastward, to

New York by canal, and to Montreal by the enlarged Welland and St. Lawrence canals, which are already being built, and, it is stated, will be completed within four years. In a letter published in November last, Hon. John Young, of Montreal, states that :

“ The Canadian Government have had frequent surveys made of those parts of the river requiring improvement to give at lowest water on the descending trip twelve feet. Messrs. Maillefort and Raasloff estimated in their report the whole cost of this improvement, giving fourteen feet of water, at \$720,000, and it is now a part of the policy of the Canadian Government to make the whole river from Kingston to Caughnawaga or Lachine navigable for vessels drawing twelve feet of water. It is only during two months of some seasons that the St. Lawrence falls to its lowest level. During the remainder of the season there is from fourteen to seventeen feet of water in the navigable channel.”

From other sources we learn that within a few years the St. Lawrence has been made navigable from Montreal seaward for vessels drawing twenty to twenty-two feet of water, whereas it was formerly adapted only for vessels drawing only twelve feet or less, and that the quantity of freight moved downward through the Welland Canal to United States ports (chiefly Oswego) has remained stationary, while the quantity moved downward to Canadian ports (chiefly Montreal) has largely increased, as the following table, prepared from Canadian official documents, will show :

TONS OF FREIGHT CARRIED ON THE WELLAND CANAL.

YEAR.	FROM ALL PORTS. Total Tons.		FROM U. S. PORTS. Tons Carried Down to	
	Up.	Down.	U. S. Ports.	Can'a'n P'ts
1861.....	154,888	865,595	427,521	217,892
1862.....	231,366	1,012,408	471,522	285,192
1863.....	290,358	850,762	407,667	195,068
1864.....	*71,935	*250,408	*102,689	*53,618
1865.....	200,719	685,157	140,139	257,910
1866.....	285,753	715,764	311,629	124,125
1867.....	244,696	688,579	293,584	150,293
1868.....	311,602	850,220	416,928	184,893
1869.....	375,054	856,849	411,635	210,008
1870.....	365,183	946,773	419,711	262,547
1871.....	395,759	1,082,363	488,476	344,181
1872.....	346,530	978,466	414,574	370,418

*Half year only. The years previous to 1864 end with December; from 1865 downward they end with June.

The same documents show that there has been a decrease of about 60 per cent. in the quantity of wheat and flour moved through the canal to Oswego, but an increase of 20 per cent. in the quantity moved from United States to Canadian ports. If such results are

apparent, what may be expected when the large lake propellers can go through to Montreal? The entire distance from Chicago is 1,276 miles, of which 1,213 miles are of lake or open river navigation, and, at the worst season, only $63\frac{1}{2}$ miles of canals, with 53 locks. On the Welland Canal, with 27 locks, and only 28 miles long, according to the statement of Mr. McIlvey, lock-tender at Port Colborne, steamers require twenty-four hours to pass through either way, and sailing vessels forty-eight hours. The ordinary trip from Chicago to Buffalo for propellers is four and a half days, or $203\frac{1}{4}$ miles per day, and 8.40 miles per hour; the delay on the Welland is therefore equivalent to 203.1 miles of additional distance, and the delay on the St. Lawrence Canal, with 26 locks, but $43\frac{1}{2}$ miles in aggregate length, would be equivalent to another day, or 203.1 miles more of distance. It cannot be expected that the new locks on the Welland, being largely increased in size, can be filled and emptied more rapidly than those now in use. Hence, with the enlargement, the entire route from Chicago to Montreal would be equivalent to 1,619 miles of open lake or river. The average rate charged for 914 miles of such navigation to Buffalo during the last three years has been $8\frac{1}{2}$ cents per bushel (of wheat), or \$2.77.4 per ton, and three mills and three hundredths per ton per mile. At the same rate, the equated distance to Montreal would cost only \$4.90.53 per ton, or 14.7 cents per bushel. Now the average rate from Chicago to New York during the same three years has been $22\frac{1}{2}$ cents per bushel by way of Buffalo, and still more by way of Oswego. It is apparent, therefore, that the completion of the Welland and other enlargements will give to Montreal an advantage, compared with the present cost to New York, of nearly six cents per bushel, which, unless counteracted by like improvements, will take from New York every bushel of grain intended for foreign exportation as long as the St. Lawrence route is open. It may be added that the distance from Montreal to Liverpool is 240 miles less than from New York, so that in 1872 ocean freights were from two to five cents in favor of Montreal, though the larger shipments by the St. Lawrence in 1872 have nearly equalized the rates.

Without doubt, as far as foreign demand affects our market, some benefit to western producers may be expected from this improvement. Yet only 16 per cent. of the wheat produced, and only 4 per cent. of all cereals, are at present exported, and the great proportion of the western surplus is and must be, by one route or another, forwarded to consumers in the eastern and southern States. The Montreal route would be unable to supply this demand, except to

the consumers dependent upon Portland. To Boston, the greater part of New England, New York, the other middle and the Southern States, other routes would still prove the more economical. Hence Montreal, able to control the market for export, but that only, would advance the price offered for wheat at the West only so far as to secure whatever might be demanded for export, and nearly the whole benefit of the reduced cost of transportation by this route would be realized by the transporters to or from Montreal, or the shippers there or at the western lake ports. The price at which the great proportion of the western surplus would be sold for consumption at the east would still depend, as now, upon the cost of transportation to the consumer, and, the general price being thus fixed, the portion required for export would be easily obtained by Montreal without materially advancing the price. For other reasons, also, the transporters and shippers by this route would be apt to charge rates higher than those proportioned to the present rates to Buffalo. The St. Lawrence River is closed by ice a little longer than the lakes and New York canals. During the later months of the year, the navigation of the lower St. Lawrence, and the stormy rock-bound sea beyond, becomes so dangerous that rates of insurance are very high. It is stated that sixty vessels clearing from or seeking to enter the St. Lawrence were wrecked in the year 1872. The natural tendency will be to crowd shipments into a season considerably shorter than the present canal season, and this must inevitably involve higher rates for freight on the lakes to Montreal, thus neutralizing the advantage to producers. But the enlargement of the Welland and St. Lawrence canals would nevertheless enable Montreal to deprive New York almost wholly of the export trade to Europe in grain, and in packed meats from the upper lakes, and of an important return traffic. Hence to New York the necessity for cheaper transportation of products from the West has become immediate and absolute.

Five methods are proposed ; the construction of a freight railway, which has already been considered : the introduction of steam on the canals ; the enlargement of the locks on the Erie ; the enlargement of the Oswego and the eastern portion of the Erie ; and the construction of a ship canal from the St. Lawrence, by which 1000-ton vessels can come through to New York without transfer of cargo. The last plan was strongly recommended some years ago by Mr. McAlpine and others, but in September last he made a contrary report, declaring the proposed route *via* Oswego the best and cheapest. A few facts serve to indicate that his later report is the

more correct, at least in this that the proposed ship canal by way of Lake Champlain would be of no service.

The route contemplated involves a ship-canal from Caughnawaga, on the St. Lawrence, near Montreal, to St. John's, 34.46 miles in length, with only three locks; thence by the Richelieu River, 23 miles, and Lake Champlain, 111 miles, to Whitehall; thence, by enlargement of the Champlain Canal and Hudson River improvement, 65 miles, with nineteen locks, to the head of navigation at Troy, and thence 151 miles by river to New York. Thus it embraces 285 miles of lake and open river navigation, with 99 1-2 miles of canal or improved river, and 22 locks. Mr. McAlpine estimates that the 1000-ton vessel will make 3 1-2 miles per hour in the canals or locked rivers; in that part of the route it would, therefore, consume 28.4 hours. He also estimates that the locks would be passed in fifteen minutes each; but, as they would be larger than the Welland locks are now, it seems reasonable to allow 30 minutes each, or 11 hours for lockage. The 39.4 hours required in the canal and locked river portion, at the average rate for open lake traffic, is 8.46 miles per hour, an equivalent to 333 1-3 miles of open voyage, costing, at 3 1-100 mills, \$101 per ton. If the remaining river and lake portion should cost no more than the average on the great lakes, it would amount to 86.35 cents per ton, and the whole cost, from the St. Lawrence to New York, to \$1.87 1-3 per ton, or 5.62 cents per bushel. But the rate to Montreal by the same steamer was 14.7 cents. The whole rate to New York would thus be 20 1-3 cents, whereas the average rate by canal has been 20 1-2 cents.

Of this plan the report of the New York Produce Exchange, already quoted, says:

"It is not possible that grain for export, laden on a vessel at Chicago, bound for Liverpool, would, on reaching Montreal, where it has a free and direct route to the port of destination, make a detour at right angles to that route, 382 miles to New York, and pay tolls through 97 miles of canal, to again make a northing of 382 miles to reach the direct route again. New York is destined to have a powerful competitor in the improved St. Lawrence route, with its enlarged canals for 1,000-ton ships. What should be done to checkmate this prospective competition for the trade of the West?"

"Enlarge the canals," is the common reply. The State Engineer, in 1863, estimated that the reduction in cost of transportation, resulting from the enlargement completed in 1862, was 50½ per cent. But the elaborate tables given in the report of the Auditor for 1872, (see Appendix C), show that the actual average charge of carriers, tolls deducted, is now, and has been in every year since 1862, higher by about one-third than the charge in 1858,

and 1859, before the enlargement was completed; that this charge was in fact higher in 1869, 1871 and 1872, than the average for the whole decade ending in 1861, and the financial report of the Auditor farther shows that in 1869, prior to the latest reduction of tolls by the State, "the rates of freight were unusually low, and those engaged in the carrying trade on the canals are greatly the sufferers. The large property and business interests of the canals are greatly depreciated in value, *to such an extent that business men are seeking other employments and better investments for their money.*" When rates are so low, compared with the cost of transportation, as to drive carriers out of the business, it cannot be said that those rates yield exorbitant profits, and hence it may be regarded as demonstrated by experience that the real cost of transportation by the canal has not been reduced at all, but has been actually increased by the enlargement. The reduction in rates charged has been actually less, since 1849, than the reduction in tolls paid to the State. The difference between theoretical and actual results is due, doubtless, to the greater cost of hauling larger boats, to the larger investment of capital required in building and operating them, to the greater loss by enforced idleness of capital thus invested, and to the increase of time required for passage of the enlarged locks. In the light of this experience, it does not seem clear that another enlargement would reduce the cost of transportation in any other than a highly theoretical sense.

Great reduction is expected from the use of steam as a motive power. It will be conceded that estimates based upon the reported expenses of trial trips of newly-invented boats are not likely to be altogether accurate, and judging from experience, are apt to greatly understate the cost. The following statement of the trip by the improved boat by Baxter, which reached New York early in November, serves to show how widely such estimates may sometimes mislead:

"The cost of transporting the 7,000 bushels of wheat brought to the city by the new boat is as follows:

Wages of Captain for seven days, at \$75 per month	\$17 50
One helmsman, at \$40 per month	9 31
One deckhand, at \$30 per month	7 00
One cook, at \$15 per month	3 50
One engineer, at \$40 per month	9 31
One engineer, at \$60 per month	14 00
Expense of keeping boat, at \$2 per day	14 00
Five tons of coal, at \$6 per ton	30 00
Five gallons of oil, at \$1 per gallon	5 00

Total\$109 62

At the above cost 210 tons of wheat were transported 502 miles, the distance from Buffalo to New York by canal. It will be demonstrated by calculation that the rate of transportation of one ton per mile was .104c., or that the cost per bushel of wheat for transportation from Buffalo to New York was 1 cent and .55 mills. This as will be seen from the items given in the bill of expenses, is exclusive of the tolls at Buffalo, on the canal, and in this city, paid in common by the steamboats with the horse-boats.

It is therefore claimed that wheat can be transported at a good profit by the steam canal-boats from Buffalo at seven cents per bushel, while the railroads, when brought into competition with the canal in summer, cannot do it profitably for less than twelve cents, and the horse-boats for less than ten cents."

Two or three items beside tolls are here omitted. Only seven days of cost of running the boat are charged against the cargo; two days are ordinarily lost in getting in and discharging cargo, and the return trip requires about seven days more. The record of tolls on eastward and westward cargoes has indicated that eastward cargoes must pay about ten-elevenths of the entire cost of the return trips, and thus the rate, instead of $1\frac{1}{10}$ mills, becomes $1\frac{9}{10}$ mills per ton per mile. Again, it has been shown that on the Erie Canal $5\frac{1}{2}$ months full employment must earn wages of hands for a season of eight months, and the above statement shows that \$320 per month must be allowed for all time lost; therefore \$896 must be charged against the quantity which the boat can move in $5\frac{1}{2}$ months, or 2,310 tons, which is 38.7 cents per ton, and (for 502 miles) 77 hundredths of one mill per ton per mile. Tolls being necessary for the maintenance and repairs of the canal are an essential part of the cost of transportation, and these are $1\frac{1}{2}$ mills per ton per mile. Already the cost has reached 4.25 mills per ton per mile, without interest or profits on capital, and the cost of the boat must be much greater than that of ordinary canal-boats. The claim that "what can be transported at a good profit at seven cents per bushel," or 4.6 mills per ton per mile, may therefore be considered a dream not likely to be immediately realized. With less costly boats, the carriers "suffered greatly" according to the Auditor's report, and "men were seeking other employments and better investments for their money," when the rates charged averaged from 8 to 9 mills per ton per mile, although the State Engineer had calculated the cost of transportation to be 2.16 mills, without tolls, interest or profits. If at that cost with allowance for lost time in returning, and for tolls, 8 mills per ton per mile gave insufficient interest and profits to the capital required in using horse-boats, the charge necessary to cover all elements of cost in using the steamboat would

be 6.27 mills per ton per mile, or $9\frac{1}{3}$ cents per bushel from Buffalo to New York—a reduction of about three cents from the average rate during the last three years. But even that charge, added to cost of transfer by elevator at Buffalo, and the average lake rate to Buffalo for the same time, would make the whole cost from Chicago to New York $19\frac{2}{3}$ cents—five cents more than estimated cost to Montreal, based upon the same lake rates. In such a competition, carriers to Montreal would realize ample profits, even while pushing rates so low as to force transporters to canal again to “seek better investments for their money.” Montreal would control the market; producers at the West would gain only what carriers to Montreal might concede; and New York would lose the grain.

Only one mode of relief remains, the combination of enlargement from Oswego to Albany with use of steam barges, as recommended by Mr. McAlpine. The question whether a New York Legislature will practically abandon Buffalo and the Erie canal west of Syracuse, need not here be considered. At the same rate per ton per mile (3.03 mills), at which the cost was estimated of transportation to Montreal by 1,000-ton vessels after enlargement of the Welland, it would cost from Chicago to Oswego (1,057 miles by lake, and 28 miles by canal), \$3.81 per ton, or $11\frac{3}{4}$ cents per bushel. Transfer into barges at Oswego now adds two cents, and the grain would then start from Oswego with a cost per bushel one cent less than the entire cost to Montreal. Even if by the use of steam barges the cost thence to New York (now $8\frac{1}{2}$ cents per bushel) could be reduced one-half, the Montreal route would still have a decisive advantage, and the entire cost from Chicago to New York would be 18 cents per bushel. Nor do the rates now charged by 500-ton propellers on the lakes, amounting to two cents per bushel per day, warrant the belief that steam vessels of such size could be profitably employed in a canal of $168\frac{1}{2}$ miles in length, with sixty-eight locks, transporting grain to New York for $4\frac{1}{2}$ cents per bushel. Mr. McAlpine estimates that the speed of the steam barges in the canal would be $3\frac{1}{2}$ miles per hour, apart from the locks; the trip of $168\frac{1}{2}$ miles would then require 51 hours. He estimates the time required to pass the locks at 15 minutes each, but at the session of the New York Constitutional Convention in 1866 a test was made for three days of the time required to pass loaded boats, night and day, through a lock of ten feet lift, and, according to the report of the New York Produce Exchange (p. 287), it was found that “the average time of locking loaded boats eastward was 17 minutes, and of those bound westward, which were nearly all minus any cargo, only nine minutes on the average was re-

quired. The boats were flushed in and out of the locks during the entire time, and the locks were fully manned night and day. These three days' work of lockage proved the fallacy of estimating the time of locking a boat at five or six minutes, especially when there is a large lockage lift of ten feet, which was the lift of the lock on which the test was made. This developed also the important fact that night lockages required about 30 per cent. more time than day lockage." In view of this test, it seems unreasonable to expect that an average time of 15 minutes for eastward bound boats can be obtained on locks larger than the one thus tested. But at 17 minutes each the 68 locks would consume 19 hours, and the whole trip through the canal 70 hours, and there yet remains 174 miles of the proposed route, 23 across Onida Lake and 151 from West Troy to New York by river, which, at ten miles an hour, would consume 17½ hours more. Thus, although the steam barges may cost less per day than the lake vessels of like tonnage, it does not seem probable that a reduction of as much as one-half can be effected in the cost of transportation from Oswego to New York. And yet a reduction of one-half would still leave to Montreal a decisive advantage.

The report of the New York Produce Exchange reasons that rates by lake may be reduced by the employment of larger vessels—a change which has for years been in progress. Yet the average rates from Chicago to Buffalo, for the four years prior to the war, were 7 $\frac{15}{100}$ cents, and for the last four years (ending with 1872) 7.87 cents. Moreover, Montreal will share any gain in cost of transportation which can be effected by means of the use of any vessels able to reach Oswego, and as against shipments to New York by way of Buffalo, even with steamboats in use, will have an estimated advantage of five cents per bushel, which no conceivable reduction in lake rates can overcome.

The review of proposed improvements seems to justify some important conclusions:

I. No contemplated route or improvement of existing routes, can be expected to place grain in New York, at a cost of transportation from Chicago of less than eighteen cents per bushel of wheat.

II. Enlargement of the Welland and St. Lawrence Canals, will make it possible to move wheat from Chicago to Montreal for 14.7 cents per bushel.

III. This may be expected to deprive New York of the export trade in grain, so far as the supply for that demand is moved by the lakes eastward.

IV. The receipts of wheat and corn at tide water by canal are

now scarcely equal, year by year, to the quantity exported, and the withdrawal of the export trade from that route will virtually leave the canal without any share in the grain movement. Transporters will seek other business, and the competition between the canal and the railroads, already ineffective for restraint of charges, will virtually cease.

V. But the movement by Montreal being mainly confined to grain for export, will not materially change the cost at which Eastern consumers will be supplied, nor will it probably raise, materially, the price paid to Western producers. England will buy at her own price, and with Montreal, and the shippers by that route, will divide nearly the whole advantage which may be gained in cost of transportation *via* the St. Lawrence.

VI. Competition from the canals ceasing, the westward movement of the center of the grain surplus, will place the control of the grain transportation to the eastward yet more completely in the hands of the railroads. In the absence of a competing route by water, their rates to eastern points of consumption rather than the comparatively small demand for export, will govern the cost of food to the consumers, and its value to the producers of our own country.

No wonder New York watches with anxiety the progress of Canadian improvements! The vast concentration of foreign trade at that city, the attending wonderful development of those domestic manufactures which depend upon such a concentration, the accumulation in one city of three thousand millions of wealth within ten years, the mastery of exchanges, foreign and domestic, for the whole country, and the splendid structures which adorn that metropolis, and the gorgeous equipages which throng its parks, are at once the fruits and the eloquent proofs of the past success of that city in grasping and controlling the export-trade in western products. If that trade passes to the little island in the St. Lawrence, an important share of the import-trade will pass with it, and the commercial mastery of this continent will leave New York forever. Not without reason, therefore, great prizes are offered for inventions, and distinguished engineers are employed upon projects which may reduce the cost of transportation to New York, while merchants call conventions to discuss the question. But all these projects must fall short of the desired result. New York is fighting against nature. The two great natural highways lead from the grain-growing regions to the seaboard. For nearly half a century the natural outlets from these channels being impeded, an artificial outlet sufficed to turn the commerce of the country into the Hudson River, and

thus has been built up a great metropolis. At length that commerce has become too vast for any artificial outlet. At length British enterprise, slow, but sure and strong, clears away the impediments from the natural channel by way of the St. Lawrence to the sea, and from the completion of that work the export trade of the West already enormous and growing marvellously, will pass from New York forever, if that city continues to rely on artificial channels. Commerce is slow to change its paths; the effects of a cheaper route will not be realized at once. But in the battles of enterprise, a single hour often determines the movements of commerce for generations yet to come. When the first loaded boat passed from the Hudson River to Lake Erie, the commercial mastery of New York for forty years was decided. When the first steamer of one thousand tons burden shall pass from Chicago to Montreal, another decision, also irresistible as the decrees of fate, will then be registered.

New York has but one remedy; to seize, to develop, and to use as its own, the other natural highway from the interior to the seaboard. Place a corked bottle in the Mississippi River at St. Paul, and if it follows uninterruptedly the natural water-currents, within forty days it will be found in the Atlantic ocean, opposite the harbor of New York. The long journey of 1,944 miles to the Gulf it will make at the rate of nearly four miles an hour, and off the mouth of that stream it enters the current of which Maury says: "It is a river in the ocean; in the severest drouths it never fails; in the mightiest floods it never overflows. * * There is in the world no other such majestic flow of waters. Its current is more rapid than the Mississippi or the Amazon, and its volume a thousand times greater." Impelled by that current at the rate of about four miles an hour, the floating messenger will pass close to the coast near New York, nature itself having supplied the motive power for a journey of nearly 3,800 miles, at an average speed greater than has ever yet been attained by steamers on artificial canals. With the aid of steam, immense cargoes can be moved from St. Paul to New York in less than twenty days, nature itself supplying more than half the motive power required. This natural channel can easily be so improved that the cost of transportation from the wheat-fields behind Winona to the wharves at New York will be less than the cost from those fields to Montreal, and by no other route or method can that result be accomplished. New York can sustain itself only by ceasing to fight against the eternal forces, and accepting nature as an ally.

APPENDIX G.

THE CHEAPEST ROUTE POSSIBLE.

Transportation by the great rivers in the direction of their currents is, of all methods, the cheapest yet known to civilization. Neither by ocean, by lake, by canal nor by railroad, can freight be moved with as little cost, all elements considered, as by the sea-ward moving currents of great rivers.

Theoretically, this is apparent, when the different elements of cost of transportation are considered. Those elements are, interest on the investment of capital required for permanent way; expenditure required for maintenance of that way; interest on cost of rolling stock or boats; expenditure for maintenance of rolling or floating stock; motive power, and wages of persons employed.

It is a fatal error to omit the cost of the capital required, from the cost of transportation. No other error leads to so many and such serious mistakes, as to the relative cheapness of different modes or routes, or the fitness of either for different kinds of business. The work of transportation varies so widely in different localities, and fluctuates so greatly in different seasons or years, that the cost of the capital needed is often the absolutely decisive element. Whether a route can be employed twelve months in the year or only six, interest for twelve months on all capital required is, in either case, an essential part of the actual cost of transportation.

The permanent way of the New York Central and Hudson River, 850 miles, actually cost \$49,865,000, or \$58,600 per mile. The 762 miles of canals in New York, cost \$64,710,000, or \$85,000 per mile, and the Erie Canal, following nearly the same route as the Central from Albany to Buffalo, cost \$131,000 per mile. The State of New York no longer collects interest on the cost of the canals; if it did so, a charge of 3.7 mills per ton per mile, would be necessary to pay that charge alone. The interest on the cost of the Central, at six per cent—not upon “watered stock,” but upon actual cost only—is \$2,971,840, or a little less than three mills per ton per mile, on

the freight business done in 1872. But nature furnishes the permanent way for transportation by lake, river and ocean.

The maintenance of the permanent way on the New York Central cost, in 1872 \$5,153,000, or \$6,600 per mile. The entire expense of repairs on the New York canals in the same year was \$1,980,000, or \$2,600 per mile. The freight business of the two routes was, on the canals 1,048,575.911 tons moved one mile, and on the railroad 1,020,908.885 tons moved one mile. The cost of maintenance of permanent way on the canals was therefore 1.87 mills per ton per mile, and on the Central 5.04 mills per ton per mile. Of the latter sum about two-thirds is properly chargeable to the freight traffic, since it required trains run nearly eight million miles, while the passengers traffic employed trains run only four million miles. But the maintenance of permanent way in transportation by lake, river or ocean, costs nothing.

The cost of rolling stock on the New York Central is stated in 1872 as \$13,434,914, and of the interest on that sum \$506,095 yearly, a large proportion is chargeable to the cost of freight traffic—for its stock consisted of 447 locomotives, 391 passenger and 158 baggage cars, and 10,983 freight cars. Allowing for the freight business two-thirds of that cost, the yearly interest thereon would be \$537,396, or .52 of one mill per ton per mile. The maintenance or enlargement of rolling stock in 1872 cost \$4,150,599; dividing this sum in the same ratio we have, as chargeable to the freight traffic, about \$2,766,000, or 2.7 mills per ton per mile. Of the capital invested in boats and teams on the canal there is no record, but since the enlargement in 1862 there have been built 3,845 boats, probably costing more than \$6,000 each, or \$23,000,000, and within three years an average of 295 each year, costing at least \$1,770,000. Of the comparative cost of floating stock in transportation by ocean, river or lake, some idea may be formed from the fact that the movement of six thousand tons of freight by rail requires six hundred cars and thirty or forty locomotives, costing not less than \$750,000: by canal it requires thirty large boats, costing perhaps \$180,000, besides horses; by lake, six propellers of one thousand tons each, costing at least \$300,000; by river, four 1,200-ton steamers, costing about \$240,000, or one tug and four barges, costing about \$120,000. Evidently, in transportation by rail the investment of capital in rolling stock alone is greater in proportion to the freight moved than any other mode of transportation. Moreover, as to maintenance of stock, the expenditure on the New York Central, as stated, is more than 30 per cent. of its reported cost, while

the depreciation of steamboat stock, even on Western rivers, with all the existing dangers and impediments, is estimated at 15 per cent. yearly.

Now, the items already considered, in which the cost of transportation by rail is necessarily greater than by canal, and by either greater than by lake or river, embrace more than half the entire cost by the New York Central, namely, 8.58 mills per ton per mile in 1872, when the average charge was 16 mills. If, instead of six per cent. interest on the actual cost of road and equipment, the whole profits realized by capital, over fourteen per cent., should be substituted, the proportion remaining for elements of cost not yet considered would be less than 5 mills per ton per mile, or less than one-third of the rate charged. But in the cost of motive power the advantage of transportation by water is also material, and especially important upon rivers in the direction of the current. Scarcely a railroad in the country shows an average of sixty miles of locomotive service to the ton of coal, and many of the best roads not more than 40 miles, which, with 15 cars to a freight train, is equivalent to 6,000 tons of freight moved one mile; and, at sixty miles to the ton and 200 tons to the train, the rate is but 12,000; while the expenditure of the steam canal-boat, according to the report of trial trip already quoted, was one ton of coal for 100 miles and 200 tons of freight, or 20,000 tons moved one mile; and even if the rate of this trial trip could be maintained in actual service, it is exceeded on western rivers by ordinary performances of tugs with barges in tow, which move six thousand, and sometimes even twelve thousand, tons of freight 200 miles per day, the largest tugs consuming from fifty to sixty tons of coal, so that the rate has been from 24,000 to 40,000 tons moved one mile to each ton of coal consumed. Thus, with a natural current to supply nearly one-half the motive power needed, with a smaller cost than any other mode of transportation of floating or rolling stock, and of its maintenance, in proportion to tonnage moved, and with a permanent way furnished and maintained free of cost by Nature, transportation in the direction of river currents ought in theory to surpass any other in cheapness.

But theories and facts sometimes disagree. Of many elaborate efforts to determine by scientific inquiry the relative cost of transportation by different methods, none has been more frequently quoted than the following estimate, made in 1852, by the distinguished engineer, Mr. McAlpine, from which, it should be particularly noted, the cost of maintenance and interest on capital were purposely excluded:

By ocean, long voyages, (3,000 miles or over).....	1 mill.
“ voyages 1,000 to 1,500 miles	2 mills.
“ short voyages.....	2 to 4 “
By lakes, voyages 1,000 miles and more	2 “
“ “ 500 miles or less	3 to 4 “
By rivers similar to the Hudson	2½ “
“ “ St. Lawrence and Mississippi.....	3 “
“ —tributary	5 to 10 “
By canals, Erie enlarged	4 “
“ large, but shorter	5 to 6 “
“ ordinary size.....	5 “
“ “ with great lockage.....	6 to 8 “
By railroads, transporting coal or other fixed business.....	6 to 10 “
“ for usual traffic, favorite grades.....	12½ “
“ steep grades, irregular traffic	15 to 25 “

Facts already presented show that great revolutions in transportation have taken place since this estimate was made. Within the twenty-one years which have since elapsed, the cost of materials used in transportation has greatly increased, and yet the railroads “for usual traffic” have deprived the Erie Canal enlarged of a very important share of its business; the use of propellers on the lakes has greatly increased, and yet the average charge for transportation on the lakes is three mills even for the longest voyages; steamers have taken a large share of the ocean traffic from sailing-vessels; and the use of barges on the western rivers has effected such a change that, on the rivers tributary and the Mississippi, the movement of freight of some kinds, for about one mill per ton per mile, is a matter of frequent occurrence. Moreover, although when strictly understood, these estimates were then, and in many respects are yet, quite correct, the exclusion of the wages of money employed from the cost of transportation has led to many blunders, and caused the figures of Mr. McAlpine to be quoted in defense of all manner of absurdities.

The only complete test of the cost of transportation by different methods is that of actual experience, for years, in the working of each, upon a route fully developed, and under the pressure of sharp competition. Under such circumstances operating expenses will be reduced, economical improvements will be devised and applied, and either by comparison of the published returns of net earnings with capital invested, or by the increase or decrease of traffic upon either of competing routes, judgment may be formed of the financial results. These tests have been applied to the great trunk railway lines, to the route by lake and canal, and to the route by lake and St. Lawrence. If transportation at the rates charged had been largely profitable upon the canals, it is certain that the movement of freight by that route would not have fallen much below its capacity, for transporters would have secured fuller employment for their boats and teams by some reduction of rates, and the canals were

open to any one who might wish to share the profits. But the Auditor of the Canal Department, in the report of 1872, referring to the reduction of tolls in 1870, says (p. 12):

"The reduction of tolls to the extent indicated, appeared, at the time it was made, to be a necessity. Great diversions of trade from other and competing routes in and out of the State had been effected. Persistent efforts had been made, for one or two seasons immediately preceding, to withdraw the commerce which naturally belongs to, and which, of course, in the absence of extraordinary efforts, to attract it elsewhere, will seek the channels of this State for transportation. At the same time an unusual competition for freight had existed between several of the lines of railroad; all seeking the trade of the West, and so great was this contest that freight was at times carried by some of the roads at prices far from remunerative. These and other concurring circumstances had seriously interfered with and diverted trade from the canals, and the tonnage was consequently reduced. The rates of freight were unusually low, *and those engaged in the carrying trade on the canals were greatly the sufferers. The large property and business interests of the canals were greatly depreciated in value, to such an extent that business men were seeking other employments and better investments for their capital.*"

This is conclusive testimony as to the effect of competition prior to the year 1870, and it is only necessary to add that the average rate per bushel of wheat for transportation from Buffalo to New York was 16½ cents in 1869, the year before the change, and had not been lower than 19, ⁶/₁₀ cents in any year since 1863. The tolls to the State were then 6.2 cents per bushel; the charge of the transporter was therefore 10 cents in 1869, and not lower than 9.4 cents in any year since 1863. But those rates, the Auditor testifies, had driven business men to seek other employments, and were so low that "those engaged in the carrying trade on the canals are generally the sufferers," and it has been shown that the quantity of wheat moved over the canals during those years had decreased from 37,000,000 bushels in 1862, to 22,000,000 bushels in 1869—though the crop of 1869 was the largest ever known—and of corn from 27,000,000 in 1862 to 9,000,000 bushels in 1869. There can be no question that the rates then reached were so low as to deprive the transporters of reasonable interest on their investments of capital. And yet since that time they have been still lower—8.1 cents in 1870, 9.5 cents in 1871, and 10 cents in 1872, tolls deducted, and the quantity of wheat moved fell to 13,000,000 bushels in 1872. It must be concluded that the minimum of actual cost, interest on capital included, has been reached on that route, at least as to transportation by horse power. Yet eight cents per bushel for 500 miles is 5.3 mills per ton per mile. Moreover,

the State does not now charge tolls sufficient to pay interest on the cost of the permanent way, and collects but little more than the cost of maintenance. Nor does it appear that the use of steam can reduce the cost by this route, tolls included, below six mills per ton per mile.

Equally conclusive seems to have been the test as to cost of transportation by lake. It is a route free to everybody, and, had the rates for movement of grain been peculiarly profitable during the years reviewed, not only would all the less profitably employed vessels upon the lakes have engaged in that business, but others would have been built. Yet the aggregate tonnage of all steam vessels on the lakes in 1862 was 125,620 tons, and in 1872—though a multitude of small tugs not before included are reckoned with steamers—it was only 164,323 tons, an increase of less than one-third, though in the same time the quantity of vegetable food moved eastward by rail on the three chief roads had increased from 956,754 tons in 1862 to 2,670,614 tons in 1872. Moreover, the total tonnage of sailing vessels on all the lakes in 1862 was 257,689, and in 1872 it was 265,189, an increase of barely three per cent. In view of these facts, no reasoning man can conclude that the rates charged had been extraordinarily remunerative, or had far exceeded actual cost, all elements included. But those rates, as statistics have already shown, have never been lower than six and a half cents, except in one year, 1870, and the average for the last three years—in which that one year is included—has been $8\frac{1}{2}$ cents per bushel to Buffalo, or 3.03 mills per ton per mile.

Of rates of freight by rail, ample details have been given, showing that 1 cent per ton per mile has been below actual cost, wages of money included, even on nearly all the great trunk lines, and that the actual cost upon other roads having a business large, yet not exceeding 500,000 tons moved over each mile operated, has exceeded $1\frac{1}{2}$ cents, and upon roads not exceeding 250,000 tons, 2 cents per ton per mile. Of ocean freights it is only necessary here to observe that the recent rate for grain from New York is about 1.5 mill per ton per mile, but in years before the war it was much lower.

Upon the Mississippi River and its tributaries it has been utterly impossible to maintain an average rate, for reasons which it is the object of this memorial to bring to the attention of Congress. These reasons are:

I. The partial stoppage of the mouth of the river, so that vessels of such capacity as to move freight at the lowest rates do not venture to risk the ruinous delays and expenses to which the bar at the passes renders such vessels liable. In consequence, the movement to the mouth of the river has not been large or steady enough to test the capacity of the route for cheap transportation.

II. The practical stoppage of navigation, during the very season in which the largest quantity of freight seeks transportation, by the rapids at Keokuk.

III. The blockade of the channel above Cairo, and, to a less degree, between that point and Memphis, during that same season, by bars which make it impossible for boats and barges to pass with such a cargo as to permit transportation at low rates, and which sometimes compel a total suspension of navigation.

IV. The blockade of the important tributaries leading from the grain-growing regions, at the same season and from the same cause.

V. The presence of many wrecks and snags in the channel, by which the risks of navigation are at all times somewhat, and at low water greatly increased.

VI. The great uncertainty which attends all navigation of a stream thus obstructed, excluding capital from free investment in competing lines, and forcing all transporters—even in the most favorable seasons and stages—to charge for the risks of the year, and for the loss of time by stoppage of business at other seasons.

These impediments have made it impossible to fairly develop the capacity of this route for cheap transportation. And yet, in spite of all these obstacles, and the inevitable increase in cost of transportation, wages of money included, which they involve, freight is even now moved by river, where navigation is possible with full cargoes, lower than by any other mode of transportation known to civilization.

Beginning with the Upper Mississippi, the rates of the "Diamond Jo" Barge Company, in connection with the Chicago & Northwestern Railway, for different seasons in 1872 and 1873, as given from the printed tariffs of the company, need only this explanation—that the railway company received for transportation 136 miles from Fulton to Chicago, three-fifths of the rate charged in each case, and the barge company, for transportation from the points named to Fulton (the distance being annexed) two-fifths of the rate charged. From April 22d to October 21st, 1872, twenty cents per 100 lbs. was charged for grain from all river points alike to Chicago, Racine, or Milwaukee; the October tariff was 25 cents per 100 lbs. from all points; and in the spring of 1873 a tariff with rates varying from 23 cts. at Dubuque, to 28 cts. at St. Paul, and 30 cts. at Minneapolis.

Thus it appears that from April 22 to October 21, 1872, the barge company moved wheat from St. Paul, 404 miles, to Fulton for 8 cents per 100 lbs., or 4.8 cents per bushel, a little less than four mills per ton per mile. But, while these were the standard rates during the season, the charge has been even less in times of active competi-

tion, in one season reaching 6 cents per bushel for the railroad, and four cents for the barge, or $3\frac{1}{2}$ mills per ton per mile. Thus far the rate, though lower than any ever reached by canal or railroad, is higher than the average by lake. But this is upon the extreme northern portion of the navigable stream, where the cargoes at low water must necessarily be small. With a full river, one tug brings down eight barges and 92,000 bushels of grain; with low water, the channel becomes narrower, admitting the passage of fewer barges, and the barges can carry cargoes less than half as large, so that in the fall five barges with 25,000 bushels was a full cargo. With good water, the trip to St. Paul and back requires seven days, and with low water nine days, six up stream and three down. But if the rate maintained until October 21st was fairly remunerative for the whole season, with an average not exceeding 60,000 bushels to a trip, and eight days' expenses of fuel and hands, the cost must have been much less in good water, with 93,000 bushels for cargo, and only seven days' expenses.

Taking next the Northern Line Packet Company, which operates 20 steamers and 70 barges on the route from St. Paul to St. Louis, we observe the effect of the rapids at Keokuk in the single fact, that while this company has brought wheat from St. Paul to St. Louis for seven cents per bushel, it cannot move grain from any point above Keokuk, during a large portion of the year, for less than 15 cents per bushel. As it costs less to ship the grain by rail to Chicago, the rate is absolutely prohibitory; the company loses the whole business above Keokuk, and that at the very season—from about the middle of August—when the grain begins to move from Iowa and Northern Illinois. It may readily be supposed that no company would lose such a business if it could be retained. But when the water falls, the river at Keokuk becomes impassable for loaded boats, and the entire cargoes have to be transferred, at an actual cost of \$2.00 per ton, not including loss of time, usually about a day and a half. In one year the actual cost to this one company of transfer of cargoes at this point was \$211,000, and, whether the quantity thus shipped is large or small, the company has to bear at all times the cost of maintaining its lighters and laborers at that point, and the still greater cost of capital invested lying wholly idle during four months, and deprived of paying employment during four months of every year. Under these circumstances, with every month of active business taxed to pay first the cost of another month of blockade above Keokuk, and second, the cost of another month of absolute inactivity during the winter, this

company has not been able to maintain such rates as could, with a channel well improved, be permanently established. And yet ten cents per bushel from St. Paul to St. Louis, 796 miles, has been a customary charge in times of good navigation, and the rate has even been as low as seven cents—a little less than three mills per ton per mile.

From St. Louis to Cairo, and all points southward, the trip-cost of navigation varies with the stage of water on the bars, while the permanent cost is controlled, precisely as it is from points above Keokuk, by the impossibility of doing a paying business during a part of the year, and that the very season in which wheat seeks a market. Nevertheless, during the months of April, May, June, July and August, an average rate of $7\frac{1}{2}$ cents per bushel to New Orleans has been maintained through one season by the barge lines, and in 1868 grain was taken by the steamers at $5\frac{3}{8}$ cents. At $7\frac{1}{2}$ cents the rate is about 2 mills per ton per mile, and at $5\frac{3}{8}$ cents about $1\frac{1}{2}$ mill per ton per mile—the ordinary ocean rate from New York to Liverpool. But even this rate it must be remembered has been attained with navigation practically loaded with charges for months of idleness, and for constant risks.

The Ohio river, even more impeded than the Upper Mississippi, nevertheless performs transportation for a commerce of seven hundred millions yearly. From Pittsburg to Cairo, whenever the river is navigable, coal is moved at a cost of one dollar per ton, 975 miles—barely one mill per ton per mile. From Pittsburg to New Orleans, in spite of the higher cost of fuel in the lower river, coal is ordinarily moved for \$2.50 per ton, 2,025 miles; and from Cincinnati to New Orleans, \$1.75 per ton, or seven cents per bushel, is a usual rate, equivalent to 1.1 mill per ton per mile. Less than one-tenth the ordinary cost of transportation by rail; less than one-fifth the lowest average ever reached on the canals of New York, and barely one-third of the average rate by the lakes, this is the lowest which has yet been obtained in the regular and ordinary movement of any class of freight in this country. And yet it is far above the rate at which, with eight feet of water from the mouth of the Missouri to the Gulf, a channel free from snags and wrecks, and the mouth of the river open to the ordinary ships of commerce, grain will be moved to the sea.

Capt. George H. Rea, President of the Mississippi Valley Transportation Company, states that the quantity of fuel taken out from St. Louis for a trip to New Orleans and back is 30,000 bushels, and that a tug, costing \$60,000, and four large 1500-ton barges costing

\$15,000 each, will make the run to New Orleans with good water in five days, and the return trip in ten days, but that the average time is now six days down and twelve returning, and with loss of one day at each terminus for taking in and discharging cargoes, twenty days to each trip. He states that the number of hands employed and wages paid, for such a fleet, is

One Captain.....	\$200	per month	\$200
Two Pilots, each.....	250	"	500
Engineer.....	125	"	125
Assistant Engineer.....	75	"	75
Carpenter.....	100	"	100
Six firemen, each.....	35	"	210
Six coal heavers, each.....	30	"	180
Mate.....	125	"	125
Second Mate.....	40	"	40
Eight roustabouts, each.....	30	"	240
Chambermaid.....	20	"	20
Cook, (on trips).....	150	per day,	45

\$1,860

For a trip of twenty days, the wages would therefore be \$1,240, and Capt. Rea states that the subsistence of the men on a trip costs \$30 per day, or for an average trip of twenty days, \$600. Adding \$2 per day for oil, waste and tallow, the trip expenses amount to \$1,900, besides 30,000 bushels of fuel.

The annual coal statement for 1873 shows that the average price of coal at East St. Louis was $8\frac{1}{2}$ cents per bushel, and the cost of moving it across the river and delivering it at city residences, 4 cents per bushel. As the tugs may obtain supplies from the east side, 10 cents per bushel is a liberal allowance for coal, and the cost of fuel per trip should not exceed \$3,000. This supposes an actual consumption of the full supply taken out, 1,200 tons, or sixty-six tons each running day, while the actual consumption is often about fifty tons. With this liberal allowance, the cost of a trip does not exceed \$4,900.

In these appendices several estimates of cost of transportation by different methods and routes have been quoted, such as that of the trial trip of a canal steamer, and that of the distinguished State Engineer, who reported that the actual cost of transportation on the Erie canal was $2\frac{16}{100}$ mills per ton per mile. In all these estimates, only the time actually employed in moving a cargo, and the expenses during that time, are considered; the lack of return cargoes, the interest on capital and wear and depreciation of property being usually omitted. An estimate of the cost of transportation by barges on the Mississippi river, prepared on the same plan, would result thus: Cost for 20 days being \$1,900, the cost for six days, the

average time occupied in moving six thousand tons southward, would be \$570; fuel for six days, at 50 tons per day (going down), \$750; total cost of transporting 6,000 tons, \$1,320, or 22 cts. per ton, $\frac{17}{100}$ of one mill per ton per mile. If such an estimate is of no value, very many others commonly found even in official documents are not more instructive.

The return cargoes on the Erie Canal pay only about one-eleventh of the receipts from eastward cargoes; on the great trunk railways, the eastward exceeds the westward traffic in the proportion of three to one; and in lake navigation, about the same. The receipts at St. Louis by river, from the southward, during the last three years, and the shipments southward by river, are shown by the following:

	SHIPMENTS. Downward	RECEIPTS. Upward.
1871.....	636,157	428,935
1872.....	706,581	419,070
1873.....	711,915	349,489
	<u>2,054,653</u>	<u>1,197,494</u>

Average receipts, or upward freight by river are, therefore, fifty-eight per cent. of shipments, or downward freight. If improvements of navigation would increase downward shipments of grain, the opening of the port of New Orleans to the largest ocean vessels would also increase upward shipments of imported goods or bulky manufactured products from the east. But to avoid all possible question, let no allowance be made for increase of upward cargoes; the average upward freight actually taken by the Mississippi Valley Transportation Company, through the year 1872, was 625 tons per trip, and the average rate charged \$4.50 per ton— $3\frac{1}{2}$ mills per ton per mile, little more for movement against the current than the average on the lakes. With desired improvements at the mouth of the river, and increase of commerce at New Orleans, it is at least safe to estimate that upward cargoes will not be less than they actually have averaged already. The return cargoes would, therefore, pay \$2812, leaving, of the cost of the trip, only \$2088 to be borne by southward cargoes. If this estimate should omit, as those employed to recommend other routes usually do, the wages of capital and the replacement of property, the apparent cost of moving 6,000 tons of freight 1,250 miles to New Orleans, would be 34.8 cents per ton, or $\frac{74}{100}$ cents per 100 lbs., and $\frac{94}{100}$ cents per bushel of sixty pounds, or $\frac{27}{100}$ of one mill per ton per mile. It is by methods even less complete that a cost of 2.16 mills per ton per mile by horse-boats and 1.04 mills by the new steamer on the Erie canal were estimated.

Interest at ten per cent. on the cost of one tug and four barges, would be \$12,000 yearly. The repairs and depreciation of steamboat property are usually estimated at about fifteen per cent. yearly, and it is believed by men of long experience, that less than ten per cent. would cover all repairs and depreciation if the obstructions and impediments which now make navigation dangerous and uncertain were removed. But to avoid all possible dispute, let it be supposed that even with the stream fully improved the cost of repairs and depreciation of property will equal twenty-five per cent. yearly, or \$30,000. These elements of cost, so often omitted, amount to \$42,000 yearly. Once more, if the method pursued even in some of the most careful estimates should here be followed, interest and depreciation for twenty days would be charged as a part of the cost of each trip, amounting to \$2,300, so that "the whole cost" of moving 6,000 tons would be \$4,388, or 73 cents per ton, and $\frac{5.8}{100}$ of one mill per ton per mile. But even in this estimate there is the same fatal error so often referred to already—it makes no account for loss of time by non-employment of capital and hands.

Eighteen full trips can be made in a year; with an improved channel there need be no interruption except from ice. On the Erie canal and the lakes, navigation is interrupted from that cause, about five and a half months each year. But at St. Louis, ice does not close navigation an average of twenty days in the year. The number of days in which navigation southward from that point has been wholly suspended, either from ice or low water, were in 1859, twelve days; in 1860, fourteen days; in 1861, seven days; in 1862, fourteen days; in 1863, twelve days; in 1864, thirty-eight days; in 1865, sixteen days; in 1866, seventeen days; in 1867, seven days; in 1868, thirty-one days; in 1869, seven days; in 1870, ten days; in 1871, forty-nine days; in 1872, twenty-five days. The average is eighteen days, and the one trip thus interrupted could at that season be made with profit from Cairo.

But there still remains that difficulty, the effect of which, in enhancing cost of transportation, has been traced on other routes namely, the inconstancy or periodicity of all employment in the movement of agricultural products. It will be shown that transportation upon the Mississippi and its chief tributaries has in this respect a very remarkable advantage over any other route, so great that with needful improvements effected, the transporter may obtain ample employment during all seasons of the year. But even now, the actual movement of the crops at St. Louis is such as to afford employment equivalent to 8.6 months in the year; the whole quan-

tity moved is $8\frac{1}{2}$ times the largest quantity moved in any month. This suffices for thirteen full trips. All charge for subsistence ceases when the boats are lying idle, and nearly all the men are employed only for the voyage. But let it be supposed that one-half the wages are paid the year round; thirteen full trips have then to bear \$42,000 for wages of capital, and \$930 for wages paid in each idle month, or \$3,100 during the year. The account will then stand thus:

COST OF TRANSPORTATION.

Depreciation and repairs.....	\$30,000
Interest on capital at 10 per cent.....	12,000
Wages, $8\frac{1}{2}$ months at \$1,860 per month	16,120
“ “ “ at \$930 “	3,100
Subsistence, 13 trips, at \$600 each.....	7,800
Fuel, 13 trips, at \$3,000 each.....	39,000
	<hr/>
	\$108,020
Upward freights, 625 tons each trip } (8,125 tons), \$4.50 per ton, }	36,562
	<hr/>
Cost of downward transportation	\$71,458

Thirteen full trips would take downward 78,000 tons. The cost would therefore be 91.6 cents per ton, or $\frac{7}{100}$ of one mill per ton per mile. At a charge of one dollar per ton, or three cents per bushel from St. Louis to New Orleans, the transporter would realize \$6,542, besides ten per cent. interest on his capital—nearly fourteen per cent. Here elements of cost exceedingly important, and yet wholly omitted in ordinary estimates, seem to be fully included. It is not intended to present these figures as covering all possible items of expense incident to the work of transportation, but rather for comparison with estimates of cost by other methods based upon consideration of the same elements, or the omission of some. It is idle to attempt to predict what rates may be reached by means of a method and route not yet tested by experience; even the transporter upon a well established route cannot foretell precisely what the transportation of a given quantity of freight will cost during the year to come. But these figures, embracing all the important elements, the effect of which can, in any measure, be estimated, show, by contrast with results reached in transportation by other modes, that the movement of bulky freight is not only effected already at less cost by the Mississippi River and its chief tributaries than by any other method, but that a surprising and well-nigh incalculable reduction in cost may be effected by improvements. They indicate that at a cost not greater than three cents per bushel grain can be moved to New Orleans whenever improvements of the river and

its mouth have secured ten feet of water at all times from St. Louis to the Gulf, and ample entrance and outlet for ocean commerce at New Orleans.

But it is at this very point that the absolute necessity of improvement of the river, in order to secure cheap transportation, is most forcibly shown. Because navigation is now liable to be interrupted by low water, and because the bar below New Orleans excludes a large proportion of the ocean vessels in which freight can be cheaply transported, the trips actually made by the tugs of the barge company have averaged only about seven each year, and even then they have either been unable to take full cargoes on account of low water, or shipments southward have been prevented by the lack of freight-room at New Orleans. Now, if seven trips have to bear each its share of a yearly charge of \$42,000 for interest, repairs and depreciation—namely, \$6,000—and if, moreover, the cargoes taken do not average more than 3,000 tons each, the cost of moving 3,000 tons becomes \$8,088, or \$2.70 per ton; over eight cents per bushel of wheat, and two mills per ton per mile; if the cargoes average only 2,000 tons, the cost becomes \$4.04 per ton, or 12 cents per bushel, and 3.2 mills per ton per mile. The average cargo taken down in 1872 was actually only about 2,000 tons, and in 1873 about 3,000 tons per trip. Startling as are these effects of obstructions to navigation upon the cost of transportation, they are by no means all. Barges of large size cannot profitably be used at all when the water is low. For 1500-ton barges, nine feet of water are necessary; for 1000-tons, seven feet; so that when there is only six feet, smaller barges are used, with only 800 tons cargo, and only 600 tons with five feet. Moreover, the width of the channel decreases as the water falls, and when it is crooked or narrow the number of barges which can be managed by a tug decreases, the ordinary tow being about 200 feet wide and 500 feet long. Hence, to operate in the river, obstructed as it is, a company must have a second supply of small barges for the low water season, which ordinarily extends through six months in the year. The double expenditure of capital involves still higher charges for non-employment and lost time; for interest, repairs and depreciation. And thus it is that, instead of three cents, or even eight cents per bushel, charges much higher have been necessary in the low-water months.

Minute attention has been given to the workings of the barge system, only because they illustrate more clearly than can be done otherwise, first, the relative importance of different elements in the cost of transportation, and second, the extraordinary effects of im-

pediments in the navigation of that channel, which was clearly designed to furnish to this favored people cheaper transportation than any other nation upon earth enjoys. They show how a cost of $\frac{1}{100}$ of one mill per ton per mile for wages, subsistence and motive power, becomes $\frac{27}{100}$ of one mill, when the return trip is taken into account, and $\frac{58}{100}$ of one mill when wages of capital fully employed are included in cost, and $\frac{72}{100}$ of one mill when loss of time from periodicity of the movement of crops is included; and finally, in high water two mills, and in low water more than three mills per ton per mile, when the effect of obstructions to navigation is considered. Thus a single bar, which a few thousand dollars would remove, though it may be the only one in 1,200 miles of navigation, if it stops the passage of fully loaded boats, will double, and even treble, the cost of transportation, and tax transporters many thousands, and the producers of the West many millions of dollars.

It is not necessary to say that the same principles apply to the navigation and transportation by steamboats. Peculiarly adapted as the barges are to the movement of some kinds of freight long distances, they cannot enter a very wide field in the uses of commerce to which the steamboat of western rivers is absolutely necessary. The enormous business dependent upon that service, and the large capital invested therein, will not be neglected by a government careful of the welfare of the country. But to the multitude of steamers which perform this service, removal of impediments to navigation, and especially of obstructions from the channel of the river is even more necessary than to the barge system. More costly in operation, they are able to perform a far more varied service when an unobstructed navigation enables them to run with regularity and to carry full loads; but bars, snags and sunken wrecks not only deprive them in a measure of usefulness, but constantly endanger the lives of passengers and crew. Nor is the magnitude of the river commerce generally appreciated. Reports of commercial bodies only show that it must be measured by millions of tons, but yet give no idea of the vast traffic which goes on, unrecorded but unceasing, between the multitude of towns connected by twenty thousand miles of interior navigation.

Long ago, private enterprise would have expended millions in perfecting this navigation had there been a chance for that private remuneration which stimulates the building of railroads. But of this, the nation's own highway, no expenditure, however great, can secure to anybody exclusive use. Only because it is and must be

free to all, private capital can find no profit in its improvement. If any State, by expenditure in its improvement, could acquire the right to recover its outlay, as New York has recovered the cost of the Erie Canal, by a tax upon the commerce using the benefits thus conferred, there is not a State in the Union but would gladly embrace the opportunity. Louisiana, in all her poverty, could borrow one hundred millions for the improvement of such a stream, if the expenditure would only entitle her to tax the commerce thereby aided. So vast is the commerce to which the benefits of such an improvement would extend that, were it possible, or desirable, to impose upon it a tax only as large as New York now collects on traffic over the Erie canal, 3 mills per ton per mile, that tax would yield about seventy-five millions of dollars yearly.

This great river belongs to no State. It is the nation's free highway. It forms part of the boundary of ten States; steamboats upon the river and its navigable tributaries, penetrate to eighteen States; and its branches are found in twenty-three States and six territories. The improvement and control of such a stream can be entrusted to one power only—the United States of America. And surely such a trust will not be refused or neglected because for some States it has not a local interest. As well leave the care of the national capital to Virginia and Maryland, and the protection of our sea-coasts and frontiers to the several States bordering thereon.

It is by this stream, the common heritage and highway of the whole nation, that the cheapest possible transportation may be obtained. No ocean vessel can move 6,000 tons of freight with an outlay of \$120,000, and neither on the ocean nor on the lakes can a vessel pursue its voyage without risk from winds or storms, propelled always free of cost, with a cargo however heavy, at a rate of more than three miles an hour, toward its destination.

APPENDIX H.

LATITUDE AND COST OF TRANSPORTATION.

A route eastward through southern Minnesota *via* Winona, must either have more spring wheat to move, from the middle of September to the middle of October, than it can possibly carry, or during other months of the year it will not have enough freight to keep all its cars busy. Thus, the La Crosse division of the Milwaukee and St. Paul, in 1871, moved 7,500,000 bushels of wheat, and 361,653 barrels of flour eastward, and all its other freight during the year, in both directions, was apparently not equal in tonnage to the 261,000 tons in these two items.

A route eastward from the immense corn region of central Illinois, will either have more freight than it can handle in August and September, or many empty cars during a large portion of the year.

A route through the great winter wheat region about St. Louis, will have ample employment from that crop in July and August, but must look for other business in other months.

A route eastward, through the great tobacco fields of western Kentucky and Tennessee, in which more than half of the tobacco crop of the United States is produced, would move, as some do, large quantities of that produce in May and June, and a still larger quantity goes southward from the river counties in April.

A road eastward, traversing the largest cotton producing district in the United States, would pass above the southern boundary of Arkansas, and across Mississippi, cutting that belt where it is about 200 miles wide, east and west, and yet extends along the Mississippi River 300 miles on either hand, north and south. No railroad could reach 200,000 tons of cotton which that district sends to New Orleans, in the months of November and April inclusive, but if it could, its rolling stock would find no other sufficient products to be moved in other seasons.

Finally, if a railroad eastward could move the sugar and molasses of Louisiana, it would have of that crop about 44,000 tons in December, and 29,000 in January, but neither of that, nor of any other product in that latitude, could it find freight to employ its full stock in other months.

But from St. Paul to the Balize flows a natural highway, traversing each of these belts, and offering to each in turn, the facilities for transportation which, employed for either only, would necessarily lie idle a part of the year. And the ceaseless round of seasons, with all the varying productions of fifteen degrees of latitude, supplies to that route such steady employment throughout the year as no other can enjoy, in the movement of agricultural products.

This remarkable fact, to which little attention has been given in discussions of the problem of transportation, is nevertheless of decisive importance as to the cost of moving agricultural products by different routes. It has been shown that by every method of transportation a large proportion of cost is the wages of capital, and the yearly repair and replacement of the material which capital furnishes. Though this proportion varies, from more than two-thirds upon such railroads as the New York Central to less than one-third in transportation by barges fully employed, upon any route, it increases the cost of transportation with startling rapidity in proportion to the time the facilities upon that route remain unemployed. Still another large element of cost is the pay of hands employed, which remains comparatively the same whether the route is fully employed throughout the season, or can keep all its hands busy only during one or two months in the year. For this reason, if no other existed, that route which can obtain the most steady and constant employment for its capital, its material and its employees, has a decided advantage in the cost of the service performed. Throughout the region west of the Alleghany mountains, a very large proportion of the work of the transporter is the movement of agricultural products. Each degree of latitude, with its peculiar climate and temperature, has not only its distinctive productions, but its peculiar time for the movement of products common to different latitudes. Indian corn, produced in every State from Minnesota to Texas, neither ripens nor is moved to market at the same period from the northern and southern portions of the same State. Any route from west to east must depend for employment upon the productions of that latitude in which it lies, and can find full employment only during the months in which those productions seek a market in that climate. But the route which nature has planned crosses every zone of climate from the polar to the tropical, with its navigable arms reaching westward and eastward along each parallel of latitude.

The importance of this fact, and the perfect adaptation of the route by river to the movement of the agricultural products, of the West will be clearly shown by a comparison of the monthly re-

ceipts at different points. Beginning with the spring wheat of Minnesota and Wisconsin, for which Milwaukee is the chief market, we find the receipts at that point thus recorded :

Months.	1871.	1870.	1869.	1868.
January	3,803	26,999	32,319	18,998
February	5,744	32,929	82,412	22,490
March	54,695	11,193	65,491	63,013
April	1,770,764	1,263,266	844,320	884,506
May	2,191,772	2,526,187	1,950,348	1,186,661
June	1,650,220	2,035,743	2,900,389	719,829
July	1,216,608	1,840,243	1,572,717	554,992
August	998,736	1,662,799	419,984	415,411
September	2,240,136	1,699,867	1,375,867	2,204,647
October	2,236,638	2,568,566	2,504,974	2,659,213
November	1,024,206	2,411,337	2,515,920	1,095,386
December	16,865	58,724	9,058	53,030
Totals	13,409,467	16,127,838	14,274,799	9,878,090

In neither of these years did Milwaukee receive two million bushels of all other grain; handling twenty to twenty-three million bushels of wheat yearly, flour included as wheat, that city received in 1871 only 770,000 bushels of oats, 576,000 of barley, 419,000 of corn, and 208,000 of rye. Thus its grain traffic is practically limited to wheat, and the new crop begins to pour in during September. The movement reaches its maximum from Sept. 15th to Oct 15, when the receipts average 140,000 bushels daily. But the anticipated closing of the lake route cuts off this movement in November, and by the middle of that month the daily receipts fall below 50,000 bushels, and by the end of the month to little more than 10,000. When the navigation reopens in the spring the remainder of the crop comes forward, having been imprisoned five months by the blockade of its natural route southward by river. For, during the two months of September and October, all the railroads, if worked to their utmost capacity, cannot move to the lakes the wheat which seeks a market. About a fifth of the surplus which reaches Milwaukee is moved by rail during the winter, and the rest waits for cheaper rates in the spring.

Chicago, though it receives a large quantity of wheat, draws more largely from a region farther southward—in Northern Iowa and Northeastern Illinois. Owing to this trifling difference of latitude, its receipts are largest in August, as the following statement shows :

CHICAGO MONTHLY RECEIPTS OF WHEAT FOR 1872.

RECEIVED BY	Jan.	Feb.	March.	April.	May.	June.	July.
Lake				31,300	7,240		
Ill. & M. Can'l			200				4,608
C. & N.W. R'y	192,460	69,300	47,212	91,216	285,800	419,000	443,580
I. C. R.R.	115,070	52,570	15,970	10,660	87,870	249,500	118,430
C., R. I. & P.	52,976	10,742	700		324	16,008	35,254
C., B. & Q. Rd	32,261	5,630	2,155	358	7,405	7,771	8,170
C. & A. R'd							350
M. C. R'd	1,712	2,354	2,114	2,784	2,433	350	388
L.S. & M. S. Ry	100	1,547	3,619	12,197		300	63,600
P., Ft. W. & C.	400	1,400	2,350	480			
P., C. & St. L.	3,350	2,842	2,665	666	685	1,400	1,080
C., D. & V. Rd					800		
Total	398,329	146,885	76,985	149,661	392,557	694,329	675,460

RECEIVED BY	August.	Sept.	October.	November.	December.	Total.
Lake	128,310			538		167,388
Ill. & Mich. Can'l						4,808
C. & N.W. R'y	1,150,920	1,006,620	1,440,150	863,960	596,590	6,606,808
I. C. R'd	380,990	564,990	758,440	343,050	257,905	2,955,445
C., R. I. & P. Rd	801,825	284,450	314,021	147,750	129,400	1,793,450
C., B. & Q. R'd	346,055	130,876	24,486	157,104	28,167	1,010,478
C. & A. R'd	21,250	2,400	1,070			25,070
M. C. R'd	1,707				714	14,556
L. S. & M. S. Ry	2,994	1,261	22,800	6,000		114,418
P., Ft. W. & C. Ry	142	480				5,252
P., C. & St. L. Ry	2,600	2,195	2,705	360	360	20,908
C., D. & V. R'd	4,000	800				5,600
Total	2,840,793	1,994,072	2,823,672	1,518,762	1,013,136	12,724,14

The crowding surplus from Minnesota and Wisconsin also swells the receipts here during the month of October and early in November, but an eastward line through Northern Iowa and Illinois would either find its rolling stock insufficient in August and September, or would have full employment for its stock less than four months in the year. The Chicago and Northwestern has branches reaching over Minnesota and Wisconsin from Lake Superior southward, Iowa as far south as Cedar Rapids and Omaha, and Northern Illinois, and can thus employ its rolling stock in moving the crop of four degrees of latitude successively. Yet its actual movement of wheat during the year 1872, was 6,606,808 bushels, but in October alone cars were used in moving 1,440,150 bushels, so that those cars were employed in hauling wheat during the whole year, only the equivalent of four and a half full months. For the October move-

ment 4,320 cars were required, but that number of cars would have moved all the wheat taken over the road in four months and a half, and so far as they depend for employment upon the wheat movement must stand idle the equivalent of seven and a half months out of twelve. Fortunately for the shippers of Chicago, but not for the farmers who are forced to depend exclusively upon its facilities, a great quantity of corn is also imprisoned during the winter and spring, and comes forward for shipment by way of the lake during the summer months, or is hurried to market in the fall before it is really fit for safe shipment, in order to avoid that long confinement or shipment at the high winter rates. But for that fact the route by lake, if dependent only upon the productions of its proper latitude, would require for the movement of wheat in August, freight room for 3,500,000 bushels; in September for 4,700,000 bushels; in October for 5,600,000 bushels, and thus out of 28,000,000 bushels, seeking shipment during the whole year from Chicago and Milwaukee, 13,600,000 bushels come forward in three months, room for 5,600,000 bushels must be supplied in one month, and the entire movement of the year would give employment equivalent to only five months for the vessels then required. Capital so employed that it can earn money only five months out of twelve must charge high wages during these months. But owing to the want of sufficient facilities on the lakes when the demand is greatest only about 22,000,000 bushels of wheat go by water, and only 4,700,000 bushels in October. A table already given shows the shipments of all grain by lake from that port during each month of navigation in 1872, and adding the shipments of wheat from Milwaukee—the quantity of wheat forwarded from Milwaukee by rail during those months, and the quantity of other grain shipped from that port, being alike insignificant—we have the following:

SHIPMENTS BY LAKE.

	BUSHEL.
April	3,422,897
May.....	3,844,892
June.....	10,771,309
July	11,001,840
August	12,293,317
September	10,994,485
October	13,668,345
November	5,724,500
	<hr/>
	73,721,085

Thus it appears that while seventy-three million bushels were shipped from these two ports by lake during the season of 1862, not less than 13,600,000 were shipped in a single month, and that

freight-room required during that month was employed barely the equivalent of $5\frac{4}{10}$ months out of twelve. Even this measure of employment, it appears, is in excess by one full month of the natural requirement of the productions of the latitudes north of Clinton or Cedar Rapids, Iowa, and is due only to the want of an economical route farther southward for the movement of the corn of central and southern Iowa and Illinois. For if such a route existed, of eighteen million bushels moved in April, May, June and July, the larger part would have found its way to market earlier. Comparatively closed up as is the route by river, the lack of freight room from New Orleans ordinarily causing a stoppage of shipments even before low water in the river arrests them, the quantities of corn received at and shipped from St. Louis each month, plainly indicate the season in which that crop would naturally be sent to market, from the great corn-growing district of Illinois :

CORN RECEIPTS AT ST. LOUIS.

1872.	BUSHEL.
January	780,772
February	681,625
March	1,071,742
April	1,269,332
May.....	1,387,046
June	1,504,662
July.....	778,405
August	598,898
September.....	243,009
October.....	412,153
November	478,690
December.....	231,970
Total (wagons included).....	9,479,387

Even during the winter, when the shipment to St. Louis is mainly by rail, the quantity forwarded each month is larger than in July and August, while during the four months March to June inclusive, with an early opening of navigation on the Illinois River, the outpouring of corn is considerable. But after that time, nearly the whole crop went southward in 1872 ; not because the rates by lake and canal were then reduced, for they were not, nor because the rates southward suddenly changed, for the statement of monthly rates by barge shows that there was no change in 1872 until the middle of August, but because the bar at the mouth of the river excludes a large proportion of ocean vessels, and as cotton, by its greater value in proportion to the space occupied, is able to pay higher freights than grain, the vessels which enter that port at all come mainly in the season when cotton is being shipped.

The great winter-wheat district in Southern Illinois and Missouri,

and the district of the same latitude in Ohio and Indiana, next claim attention. The time at which this crop is naturally moved appears from the contrast of receipts at St. Louis in 1871, and in 1872 when the winter wheat crop was almost a total failure:

RECEIPTS OF WHEAT AT ST. LOUIS.

	1871.	1872.
January.....	278,017	224,396
February.....	287,011	216,143
March.....	464,167	388,195
April.....	388,946	476,547
May.....	513,419	324,777
June.....	386,663	166,591
July.....	1,222,727	271,459
August.....	1,084,617	821,517
September.....	929,869	1,091,375
October.....	681,135	997,493
November.....	405,300	465,107
December.....	329,018	254,312

Total (wagons included) 7,311,910 6,007,987

From this crop, which begins to come into Cincinnati also in July, so that the receipts at that point reach their maximum in August, a route eastward might receive a large employment in the months of July and August, but no sufficient business either earlier or later. Going farther southward, we reach the immense tobacco region of western Kentucky and Tennessee. From the two states comes more than half the tobacco grown in the country, and Missouri and the river counties of Illinois, Indiana and Ohio, also contribute considerable quantities. The receipts at St. Louis and New Orleans show the time of shipment of this crop. In 1871 and 1872 the receipts at those points each month were, in hogsheads:

	ST. LOUIS.		N. ORLEANS.	
	1871.	1872.	1871-2.	1872-3.
January.....	126	233	656	76
February.....	634	489	622	1,399
March.....	1,088	960	3,388	4,345
April.....	1,238	1,512	7,000	9,423
May.....	1,524	2,148	6,587	7,241
June.....	2,678	3,092	5,693	4,349
July.....	3,568	1,836	2,300	1,842
August.....	3,208	1,394	313	1,354
September.....	1,349	448	310	96
October.....	488	248	106	20
November.....	427	242	79	39
December.....	215	74	81	7

A route eastward would have a considerable freight from tobacco in June or July, if reaching the latitude from which St. Louis draws supplies, and in March, April and May, if reaching the latitude from which the New Orleans supply is more largely drawn, but the route from north to south will receive from this crop at least 3,000 tons

of freight in each of the months of March to July inclusive. There is also a very productive but small cotton district below the confluence of the Ohio and Mississippi, the surplus from which naturally moves southward.

By far the most important cotton growing belt in the country extends along the White and St. Francis rivers in Arkansas, and from the western part of the State along the Arkansas river, and thence southward on either bank of the Mississippi, for some distance below the mouth of the Red river, with a long arm reaching up that stream as far as the Indian territory. The receipts at New Orleans will show that this important crop is moved mainly in November, December, January and February. From Louisiana, also, is received a crop of sugar and molasses which, though small compared with a production of 459,410 hogsheads eleven years ago, is still considerable, and is moved mainly in December and January.

The following table gives in tons the quantities received monthly, first of molasses, and second of sugar, at New Orleans; third, of cotton at New Orleans; fourth, of tobacco at New Orleans, and fifth, at St. Louis; sixth, of corn, and seventh, of winter wheat at St. Louis; eighth, of wheat at Chicago, and ninth, of wheat, at Milwaukee; and, finally, the total in tons each month. Thus, the first and second columns indicate the movement natural to the productions of the latitude of New Orleans, and the relative monthly employment which an eastward route on that latitude might expect; the third the movement natural to the cotton-growing latitude; the fourth and fifth the movement natural to tobacco, the chief surplus of Tennessee, Kentucky, and the river counties of Ohio, Indiana and Illinois, and part of Missouri; the sixth the relative monthly employment which an eastward route, dependent upon the great corn-belt of Central Illinois, Iowa, Indiana and Ohio, may expect; the seventh the movement of the winter wheat districts on the latitude of St. Louis and Cincinnati; the eighth the natural movement of wheat from the Nebraska and Iowa districts; and the ninth the natural movement of that crop from Minnesota and Wisconsin. In every one of these districts there is a long season, during which the natural movement of the agricultural products of that latitude gives no adequate employment to transporters. But the remarkable succession of these movements, each culminating in a separate month, will arrest attention. The movement of sugar is greatest in January, that of cotton in February, that of tobacco in April, that of corn in May and June, that of winter wheat in July, that of spring wheat of the lower latitudes in August, and in higher latitudes in

September and October, while the year closes with molassés in December. Is it not plain that a route traversing each of these districts, and moving in turn the products of every parallel of latitude, will find employment far more regular and constant than any other?

MONTHLY MOVEMENT OF CROPS IN TONS.

MONTHS.	N. O. Molas's	N. O. Sugar.	N. O. Cotton.	N. O. Tob.	St. L. Tob.	St. L. Corn	St. L. Wheat.	Chi'go Wheat.	Mil'ke Wheat.	Total.
January.....	*10,877	*18,552	321,208	45	138	21,421	8,340	1,949	18,270	121,700
February....	2,842	7,023	*44,231	837	291	20,448	8,610	4,391	10,657	100,333
March.....	1,016	3,906	31,073	2,607	576	32,151	13,924	2,309	5,804	94,026
April.....	135	1,278	31,605	*5,055	906	37,929	11,668	4,489	23,062	118,817
May.....	112	69	23,757	4,344	1,287	41,610	15,402	11,776	61,005	150,992
June.....	42	576	13,629	2,607	1,857	*45,138	11,599	20,229	63,777	160,954
July.....	20	339	4,896	1,104	1,101	23,352	*36,681	20,263	20,462	114,220
August.....	10	519	4,000	813	837	17,604	32,538	*85,223	22,100	164,013
September..	10	147	3,307	57	267	7,200	27,895	59,822	81,778	189,573
October..	522	378	16,910	12	147	12,301	20,433	12,361	*32,822	145,641
November..	6,804	7,569	25,059	24	145	14,358	12,159	14,360	30,420	107,857
December..	*18,161	*16,527	30,642	4	45	6,957	9,870	6,959	16,648	105,813
										1,573,339

This is the wonderful adaptation of nature's route to nature's adjustment of the seasons and their products. When that route is cleared from obstructions, the transporter will then find employment for his stock in every month of the year; below the region of ice in winter; from early spring to midsummer, bringing out the corn from the Illinois, Missouri, Des Moines, and Ohio rivers; in midsummer in moving the winter wheat; and from the first of August until navigation closes in floating down the enormous surplus of spring wheat from the Wisconsin, the Minnesota, the Upper Mississippi and Missouri, and the regions bordering these streams. The last column of the table just given shows the completeness of this adjustment, and yet by no means fully; for it gives only the aggregate of quantities now received by different routes at different cities, but does not show how greatly the producer would be helped by a route of unlimited capacity for the movement of his products at a more convenient season. Nevertheless, if the quantities now delivered in each month at the cities named were moved in the same months by a single route—as they can be by the Mississippi, if improved—that work would require freight room for only 180,000 tons in any month, and would give to the vessels engaged employment equivalent to 8 $\frac{3}{10}$ months at their full capacity.

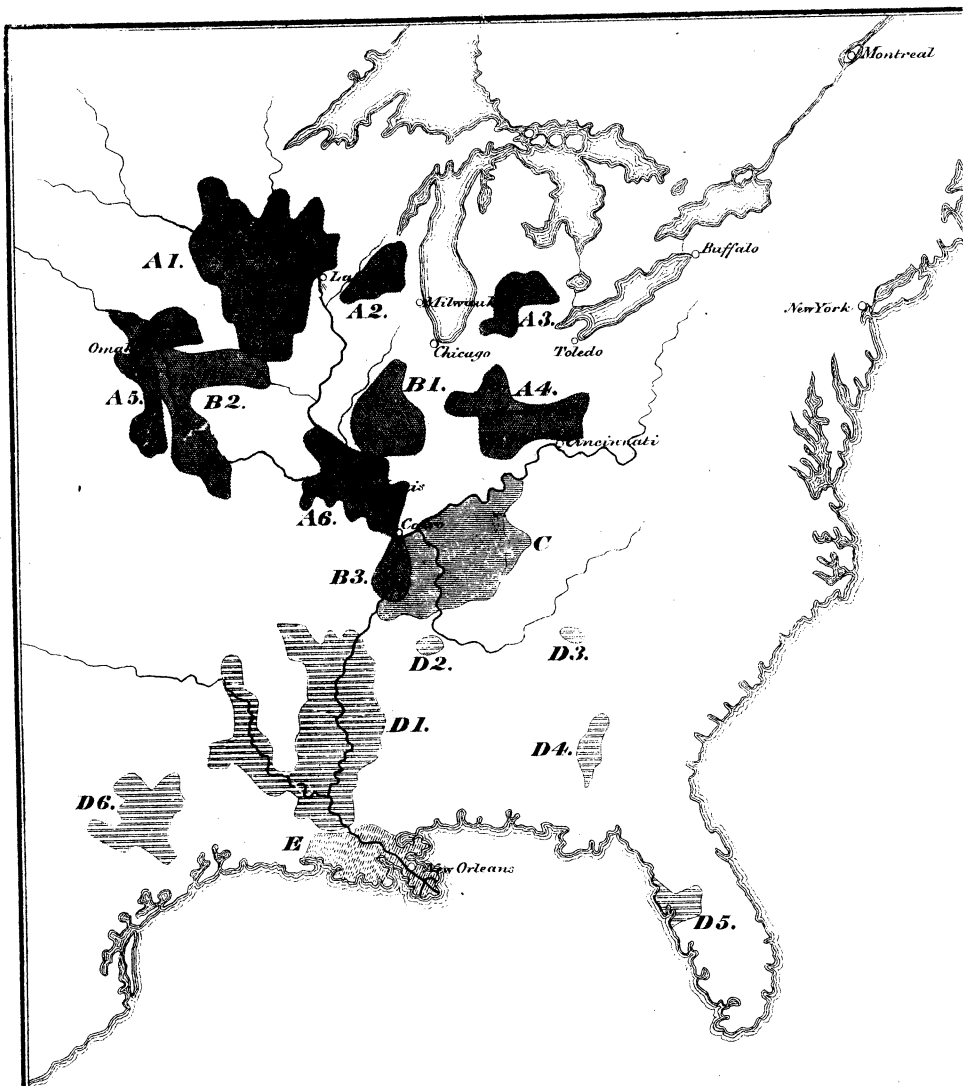
The table does not include the receipts of corn at Chicago, for the manifest reason that those shipments indicate, not the time at which the corn crop naturally seeks transportation, but the months in which, after long waiting and hoping for better rates, the producer is fi-

nally forced to send it forward. A movement more nearly natural is shown by receipts at St. Louis—large in March, increasing rapidly when the Illinois and other streams open in the spring, and culminating as early as June. With a route of unlimited capacity, the surplus held over the winter would be moved as early as possible in the spring. Thus the months of March, April, May and June would become the busiest of the year for the transporter by river. If, however, we suppose that only half of the quantity actually delivered at Chicago during each half of the year should be moved by river in proportion to the quantities received each month at St. Louis, the entire tonnage of agricultural products moved each month would be :

In January.....	165,000 tons.	July.....	197,000 tons.
In February.....	143,000 "	August	241,000 "
In March	162,000 "	September	204 000 "
In April.....	198,000 "	October.....	185,000 "
In May	235,000 "	November.....	157,000 "
In June	252,000 "	December.....	129,000 "

The entire tonnage being then nine times the quantity moved in June, the facilities required for that month would be employed the equivalent of nine full months. But the quantities now moved by way of the four cities named, afford little indication of the quantity now forwarded by other and more expensive routes, nor of the quantity of surplus grain which would now be forwarded with sufficient facilities. In this respect, the advantage of the natural route is inestimable; its capacity is ample not only for the actual shipments of to-day by all routes, not only for the large surplus which now remains unsold, but for the vastly increased production which the future will soon bring. Upon this route, with an open seaport at New Orleans, and an open channel thither, no blockade is possible at any point; any owner of boat or barge, anywhere upon rivers navigable for 20,000 miles, can engage his craft at the very point at which there may be at any time lack of freight-room. As free as the ocean itself, and as boundless in capacity for transportation of freight, this inland sea does not terminate like the lakes; in locked canals, the capacity of which is limited; nor in regions of early frosts, where the products in transit are liable to be locked up all winter in the ice; nor in a bay in the far north, whose rock-bound coasts are the most dangerous to navigation to be found from Greenland to Patagonia; but in another stream, even more majestic than the Mississippi itself—the great river in the ocean, which flows from Central America past the port of New York to Liverpool.

The adaptation of this route, with its unrivalled cheapness, its unlimited capacity, its wide-reaching arms, extending to almost



ADAPTATION OF RIVER ROUTE TO AGRICULTURAL SURPLUS.

- A.** Wheat.
- B.** Corn.
- C.** Tobacco.
- D.** Cotton.
- E.** Sugar.

Transferred from Census Crop Maps, 1870.
Tobacco and Sugar added.

every considerable district in this country in which a surplus of any agricultural product is raised, and crossing in succession fifteen degrees of latitude, each with its peculiar productions and seasons, will best be realized by a study of the accompanying map, to which has been transferred every district designated in the crop maps of the census report of 1870, as one of the highest degree of productiveness in wheat, corn or cotton, while the areas from which tobacco and sugar are mainly derived are also added. The tracts designated by the letter "A," embrace every district east of Colorado defined in the census map of wheat, as of the first or second degree of productiveness, and examination of statistics has indicated that from these districts the entire surplus of wheat is drawn. In like manner, tracts designated by the census map of cotton as of the first or second degree of productiveness, are both included. But only the tracts designated in the census map of corn as of the first degree of productiveness are here transferred, for a double reason; first, because they cover in part the same area as the wheat-growing districts, as may be seen by examining the corn-map elsewhere given, and second because statistics have shown that the surplus of corn available for shipment is in fact drawn almost wholly from the two great districts in Illinois and Iowa, of which the most productive portions are here defined. In correspondence, tobacco growing tracts of minor importance have been omitted, though they lie mainly in the bends of the Ohio and Missouri rivers.

The district marked "A 1" produced in 1873 about 43,000,000 bushels of wheat in excess of consumption, and from the upper portion of that district wheat comes forward late in September. In that month, also, the movement from "A 2" with about 14,200,000 bushels, and "A 3" with 5,100,000 bushels, probably culminates. Of these three, with 1,870,000 tons of surplus wheat, the one in Michigan and the Northern Indiana, with 153,000 tons is the only one to which an open, southward-flowing stream of unlimited capacity, would not give relief. Earlier in the season wheat would come from "A 4" and "A 5," producing in 1873 about 498,000 tons—10,700,000 in Ohio and Indiana, and 5,900,000 in Western Iowa, Nebraska and Kansas. Earlier yet, 14,000,000 bushels begins to move from "A 6," and thus from July to the closing of navigation all light draft boats can be fully employed in bringing out 2,000,000 tons of surplus wheat, of which the whole can be shipped southward at once, or a part stored at St. Louis or Cairo to be moved in the less busy months of winter, after ice has driven the up-river craft from employment there.

Late in the season, also, as long as navigation continues, corn from the vast tract in Illinois will push southward by the Illinois river and by rail, and from the region in Iowa, Nebraska and Kansas, by way of the Missouri, and by the Des Moines, so long neglected, and yet so natural an outlet from the eastern border of that tract. Producers who are in haste to market corn will have a longer season of navigation on the Illinois and from Keokuk southward, than is offered by the Erie canal or St. Lawrence, and a route open all the winter, either from St. Louis or Cairo. As many may prefer the shipment by the Gulf during the winter months, the movement of this immense crop would by this route be equalized, and distributed over twelve months, instead of crowding all routes during only five. Illinois already produces 2,000,000 tons of surplus corn, and the Iowa tract 360,000 tons, so that facilities for transportation are likely to find abundant employment from this crop at any season in which other business is lacking. In Ohio and Indiana also a surplus of 14,000,000 bushels is produced, which may, in part, find a better market by the southward route.

At present, when winter comes, more than half the boats of the Mississippi Valley are forced to lie idle. The up-river boats are lightly built, and not fit for contest with the snags which, in the lower river, now make every bar dangerous at low water even to the stoutest vessels. But with a clear channel of regulated depth, these boats would find constant employment all winter on the lower river, would double the capacity of the fleet below in that season, and at the same time, being no longer compelled to earn twelve months' wages and profits by nine months work, would be enabled to transport freight at less cost during the summer. From December, whatever light-draft vessels are not needed in moving corn and wheat from St. Louis and Cairo, could find ample employment in bringing out the cotton from the Red and Arkansas Rivers. That crop, costly to move, not on account of its weight, but of its bulk, is also so valuable as to readily bear high rates, but it would be of great advantage to the producer to be able to place his crop in market without delay. The crop now produced in the Valley States, about 2,733,000 bales, though only 630,000 tons, requires more room than forty million bushels of grain, and with present facilities much of it does not reach New Orleans until April, while the shipments from that port during the month of June were still 85,000 bales, the insufficient river vessels yet exceeding in freight-room the ocean commerce of New Orleans. But with the up-river fleet also employed below Cairo in winter, this crop also can be moved more promptly to New

Orleans, and with obstructions removed from the mouth of the river the ordinary vessels of commerce from every port will seek at New Orleans an employment which in winter elsewhere may be neither equally sure, nor equally agreeable.

Such is the route which Nature has planned. To open and utilize it is to solve the problem of cheap transportation. Not only will the opening of this route serve those whose products or purchases it may move. By its constant competition during the whole year, it will force every railroad west of the Alleghany Mountains to moderate its charges. Having the capacity to move every pound of surplus product from the West; having access directly, or by its navigable arms, to every important center of production (save one) in all that region; and having, by reason of the motive power which Nature supplies, and by reason of its adaptation for more constant use than any other, the power to transport bulky freights at lower cost than any route existing; it will become, by its constant competition, the beneficent regulator of all other routes for transportation eastward. Half a dozen men now fix rates to suit themselves. Unlock the Mississippi River, and the commerce of the world will settle their rates in spite of them. They can then charge just as much as the service they render may be worth, and not a cent more. If from any point their routes can carry freights at lower rates, or in better time, or in better condition, or with more convenient delivery, then commerce will recognize and pay for that superiority of service. But if not, then they can charge just as much and no more than the real cost of moving freight by Nature's free highway, for if they charge more without good reason, a large part of the eastward freight will be lost. On the river, as now on the lakes, freights will regulate themselves. Railway managers, even canal operators, can combine; but the river is free to any man who owns a boat or barge, and no monopoly can ever entrench itself there.

Not only the great trunk roads eastward, and the grain gatherers which reach out in every direction from the trunk roads and the lakes, will be placed under bonds to serve the people at fair rates, but even the shorter local roads connecting with such lines will be in like manner influenced. Not one of them can afford to deny to the great trunk lines access to producers of the West at fair rates, and not one of them, granting such rates away from the river, should be permitted to charge rates unreasonably higher to the river. Fair rates granted on bulky products will soon disclose the actual cost of transportation on different routes, and then reasonable rates for other freight will soon be secured.

Thus, with two great natural water routes fully improved and developed: the one by the Canadian Government and the other by the United States; the one open from May to November and the other open for more than a thousand miles all the year; the one traversing every parallel of longitude, as the other does every parallel of latitude, from their common sources in the heart of the continent; and restraining by their competition for all time to come the various artificial routes which are or may be opened; the people of this nation will find themselves more surely protected than they could be by any government of law, and more favored in facilities for transportation than those of any other land.

APPENDIX I.

CLIMATIC INFLUENCES.

To every plan of improvement, however reasonable, one prejudice is a more dangerous enemy than a thousand facts. It will be so as long as most men do not investigate for themselves. Certain prejudices against the Mississippi route have been industriously fostered for years by those whose interests lay in other directions, and these have combined with real obstacles to prevent the large use of that route as an outlet for the products of the Northwest. An examination of these objections will show that they are founded either upon beliefs altogether mistaken, or upon difficulties which reasonable improvements will remove.

Altogether the most potent of these objections is one which has absolutely no foundation in existing or recorded facts, namely, that grain shipped by way of the Gulf is especially liable to injury from the heat and humidity of the climate. So persistently has this objection been urged, that nearly every merchant in Northern cities probably has a vague impression that it must have some basis in actual experience, although he cannot call to mind a single authenticated instance which sustains it. Common sense and well known facts suffice to satisfy every inquirer that the danger from this cause must have been greatly overestimated, but the unknown is always terrible, and not many have so informed themselves of the facts that there does not remain some apprehension of a danger which alarms the more because its extent is not defined. Commerce constantly faces larger risks in other transactions because they have been defined by experience, and can be measured in calculations; it refuses to face dangers which do not exist, simply because they have not been defined and cannot be measured. The unreal, as long as it is supposed to exist, affects commerce more than the real and calculable danger.

Of all grains, corn is the most liable to injury from heating. Yet corn is constantly grown and stored throughout the year in the Gulf States, in a temperature more heated and humid than any to which it is subjected in shipment. One of the largest corn-growing dis-

tracts in the country extends (in Texas) below the latitude of New Orleans. Yet no man has ever heard of injury to corn stored in that climate during the whole year. Every one who has visited New Orleans or other Gulf ports, knows that the steady cooling breeze from the Gulf after nightfall, is a welcome relief, greatly reducing the temperature during the hot season. Corn grown and stored on plantations throughout the interior, beyond the reach of this cool breeze, is exposed, month after month, to a higher temperature than New Orleans ever experiences, and no one has ever heard that it suffers injury, and yet it is feared that in passing for three days through the Gulf, from which the winds bring a cooler temperature, corn may become heated and spoiled! Not only corn grown at the south, but corn brought thither from Illinois and Iowa, is thus stored every year on southern plantations, exposed to a higher temperature for months in succession than can be found either at New Orleans or on the Gulf, and such corn never suffers injury, and yet it is feared that the same corn, moved for three days through the Gulf, may be spoiled! New Orleans is almost surrounded by water, and its atmosphere has all the moisture, and a temperature even higher than that of the Gulf, but in that city grain has been stored for months without the least injury; not once only, but every year for half a century; in every kind of receptacle, from the smallest bins to the largest warehouses and elevators. Yet it is feared that grain cannot pass that city, being transferred there by floating elevators, and spend three days in transit through the atmosphere of the Gulf, without harm. The transfer by the floating elevators which are now used at New Orleans, not only reduces both delay and cost to a minimum, but the handling and airing is beneficial to the cargo in that as in any other climate. The voyage from New Orleans to New York ordinarily takes a week, and less than half that time is spent in the atmosphere and climate of the Gulf, but grain (both wheat and corn) is shipped every year from New York and other Atlantic ports to tropical countries, exposed to the voyage in a tropical sea for weeks instead of days, and yet no injury is apprehended. Wheat is shipped every year from California, in sailing vessels rather than steamers, for a voyage half around the globe; it passes, not the latitude of the Gulf only, but the equator also, twice in its long journey, and yet no injury is feared, and the purchaser in England does not offer a lower price because the grain has been thus exposed, but California wheat regularly commands as high a price as any in that market. Wheat is shipped to England every year from Chili, about 1,000,000 bushels, which has to cross not

only the tropics but the equator; from Bengal and Burmah, 350,000 bushels, which has to pass both tropics and the equator twice, in its voyage around Cape Horn; from Egypt, 1,500,000 bushels, and the climate of the Nile and of Cairo is more severe than that of the Mississippi and New Orleans, for the isothermal line of 70° mean annual heat, under which New Orleans lies, passes north of Palestine; and from Australia 500,000 bushels, which has to cross the equator and the tropics; corn is also shipped to England from Turkey, Egypt and Morocco: and yet we are told that grain cannot be shipped by way of New Orleans, by a route at no point descending as far south as the tropic of Cancer, without being spoiled. The people of these United States have some reputation for practical common sense, and surely, if there ever was a case inviting the exercise of that useful faculty, this is one. It is worth while to notice that the British merchants and capitalists, who come to this country so often to inquire by what route England can obtain supplies of food at less cost, never contemplate the exposure of grain to heat as a serious difficulty, or if by some zealous opponent of river transportation it is suggested, the practical Englishman thinks of wheat from California, Chili, Bombay, Australia and Egypt, and corn from Egypt and Morocco, and dismisses the objection as "blasted nonsense, you know."

But when nonsense pays, some men are not ashamed to use it, and to the people who at present force three hundred million bushels of western grain to pay an unnecessary tax of ten cents per bushel, this particular form of nonsense has paid remarkably well. It will continue to pay just as long as the Congress of these United States permits the Mississippi River to remain a blocked highway—and not one hour longer. The time is not far distant when the needs of the people of the Mississippi Valley will be considered quite as promptly as the interests of men engaged in eastern routes of transportation, and when the merchants of eastern seaports, finding that Montreal can gain and hold an absolute monopoly of the export-trade in grain from North America as long as that trade is governed by routes from the interior to the eastward, and that they can obtain grain from the West at as low a cost of transportation as Montreal, by one route only—the river and the gulf-stream—they will become as anxious to convince the world that grain moved by that route suffers no injury, as some of them are now to make men believe that grain can never be shipped through the gulf with safety.

Proverbially stubborn as facts are, prejudices rooted in self-interest are more stubborn still, and the following facts are presented, not

for the enlightenment of any whose interests lie in transportation eastward, but for the information of representatives of the people who doubtless desire to serve the interests and promote the welfare of the whole country. The people of eastern States who consume food wish to obtain that food at the lowest cost, no matter by what route. The people of the West who produce food, wish to lessen as far as possible the cost of transportation, which reduces the price paid them for their products. Fortunately, for both, the practicability of moving grain, without injury or risk from the climate, by way of the river and the gulf, has been abundantly demonstrated by experience extending through many years.

From the earliest settlement of the Mississippi Valley, the route by the river and New Orleans, at first the only outlet for its products was in constant use. Prior to the general use of steamboats, grain was loaded in rude barges, floated without other motive power than the river current to New Orleans, and thence shipped to Atlantic ports or foreign countries. As late as 1840 over four thousand of such barges were floated down the river yearly. Says the census report of 1860, "even at no distant date, all the western grain and flour which found a market in New York or New England, was shipped to New Orleans in steamboats, and thence around the Atlantic coast in ocean ships." The vast grain fields beyond the Mississippi had not then been touched by the plough, and nearly all the grain thus moved came out of the Miami, Wabash, and smaller streams tributary to the Ohio, and was thus transported from three to five hundred miles westward, then a thousand miles southward, and finally eighteen hundred miles by sea, a journey which with the imperfect facilities of those days occupied many weeks. The rude barges, floating with the current, and ordinarily in the day-time only, often took twenty-five days to reach New Orleans, and modern barges took only five or six. The ordinary steamers of those days took longer than vessels now require, both for the trip down the river, and for the ocean voyage to New York. There were no elevators, and the delays in transfer at New Orleans, were often great. And yet during all these years, when grain was moved every year by this route, and exposed every year to its temperature and climate for weeks, where now it requires only days, not a single instance of complaint because of injury to grain from the climate has yet been found or can be remembered. Cases occurred in which the grain was damaged by leakage of barges; cases occurred in which grain shipped in unsound condition spoiled on the route; and just such cases occur every year on the Erie canal. But the world may be

safely challenged to produce record of a single instance, during thirty years of constant experience, in which grain shipped in sound condition was damaged by exposure to the climate of the lower river and the gulf.

The following table of the receipts of flour, wheat, corn and oats at New Orleans in different years, and of shipments from Chicago, and receipts at Buffalo, of *all* grain, will show that the southern route was not at that time found an undesirable one, either for shipments to foreign or to Atlantic ports.

GRAIN RECEIPTS AT NEW ORLEANS.

YEARS.	Flour. Barrels.	Wheat. Bushels.	Corn. Bushels.	Oats. Bushels.	*Total.	*Chicago, all grain shipp'mnts	*Buffalo, all grain receipts.
1810.....	482,523	— 157,537	695,895	107,212	3,373,250	10,000	4,061,598
1811.....	496,104	— 66,552	671,392	135,025	3,294,539	47,700	5,502,525
1812.....	439,683	— 347,213	846,772	158,202	3,550,627	585,907	5,087,468
1813.....	531,175	— 293,620	1,068,880	301,075	4,271,450	638,907	6,642,610
1814.....	502,507	— 215,035	970,030	326,087	3,953,689	923,494	6,610,818
1815.....	513,312	— 161,837	977,110	360,616	4,163,543	1,045,620	5,581,790
1816.....	487,985	— 1,009,165	2,915,310	676,465	8,790,955	1,559,819	11,366,167
1817.....	1,617,075	— 2,084,122	5,967,275	1,470,812	17,509,614	2,243,021	19,153,187
1818.....	700,918	— 372,953	2,768,661	1,118,047	7,784,452	3,001,740	13,611,012
1819.....	1,013,177	— 597,277	4,262,845	656,397	70,592,424	2,895,958	14,665,188
1820.....	501,986	— 141,770	2,787,212	814,487	6,704,419	1,836,938	12,059,559
1821.....	911,106	— 221,991	3,247,339	1,109,352	9,374,201	4,616,511	17,749,781
1822.....	427,212	— 162,215	3,494,830	1,138,183	9,449,267	5,816,437	20,390,504
1823.....	802,672	— 118,195	3,072,577	1,177,399	10,311,422	0,292,233	15,950,526
1824.....	874,256	— 462,357	4,450,077	1,469,127	10,950,431	13,134,501	22,252,435
1825.....	673,111	— 78,220	2,775,115	1,069,945	7,319,535	16,632,750	24,472,273
1826.....	1,120,974	— 2,173,810	4,977,487	1,467,957	14,224,117	21,610,312	25,753,907
1827.....	1,797,597	— 1,919,705	4,593,627	924,927	13,958,444	18,483,778	19,578,095
1828.....	1,538,742	— 1,301,187	3,224,162	1,421,622	13,342,681	20,587,181	27,812,985
1829.....	1,184,978	— 73,912	1,838,591	624,340	8,621,787	16,754,136	22,539,723
1830.....	955,260	— 32,799	4,305,097	1,648,875	10,816,623	31,108,759	37,053,115
1831.....	1,009,201	— 179,195	9,534,777	1,381,815	16,191,822	50,481,862	61,460,601

*Flour included as wheat.

The "sack" contains about two and a half bushels, and barrels about three bushels, and as the New Orleans records of that day do not distinguish the quantities of each, the reduction to bushels at a supposed average of two and a half bushels to each sack or barrel certainly makes the apparent less than the actual quantity. But the quantity is not here of importance. The vital fact is that every year large quantities of grain are moved by this route without injury or fear of injury, both to Europe and to Atlantic ports. The climate of New Orleans and of the Gulf is not known to have undergone any very astonishing change within twenty years. Nor was this movement an insignificant one in the commerce of those days. The comparative table of receipts at Buffalo and

shipments from Chicago during the same years shows that, as late as 1853, more grain was moved to New Orleans, wheat, corn and oats only included, than to Chicago, all grains included. In 1840 the vast and fertile region tributary to Chicago had not been settled, and yet Buffalo received about 700,000 bushels more wheat than New Orleans, showing that the shipments by canal at that time were almost wholly of grain produced in Michigan and the northern portions of Ohio and Indiana. As the settlement of other Northwestern States progressed, a sharp rivalry arose between the route by lake and the route by river, for the movement of the grain thus rapidly added to our eastward commerce. In 1847, when famine caused an unusual demand from England for food, a very large proportion of the quantity exported was drawn from the West by way of New Orleans, and the receipts there were eight times as large as those of Chicago, and almost as large as those of Buffalo. But after 1852, when freights by the river southward rose from five cents per bushel to twelve and a half cents from St. Louis, the growth of the lake region, the reduction from 22 to 14 cents in the rates by the Erie canal, and, above all, the want of sufficient water on the bar at New Orleans for the larger ocean vessels by which the cheaper freights were then obtained, combined to increase the receipts at Chicago very rapidly, while those at New Orleans, though slowly gaining, were finally surpassed. As the table shows, this occurred in 1854, and prior to that time more than a third of all the grain moved from the West by all routes had been moved steadily and continuously by the route which, it is now said, cannot be used for grain shipments with safety! But even in 1856, of all the flour exported, nearly one-seventh went through New Orleans; of all the wheat, one-eighth in 1856 and one-tenth in 1857 went by that route; of all the corn exported nearly one-third in 1856 went by the very route by which some men now suppose corn cannot be transported without risk of injury. It is an instructive fact that of all grains exported, the largest proportion went by way of New Orleans of corn, that very grain which is most liable to be affected by the climate. The following record of the number of barges arriving at New Orleans each month in 1856-57, is especially interesting, as showing from what States the larger supplies then came, and at what season the grain is naturally moved:

ARRIVALS OF FLAT BOATS AT NEW ORLEANS 1856-7.

MONTH.	Ohio.	Kentucky.	Indiana.	Virginia.	Pennsylvania	Illinois.	Arkansas.	Tennessee.	Mississippi.	Total.
September.....	1	..	..	..	..	..	..	1	..	2
October.....	2	..	..	..	..	2	..	1	..	5
November.....	3	..	..	..	..	..	..	..	..	3
December.....	2	2	2	..	..	..	1	1	1	9
January.....	15	4	13	..	..	1	2	1	..	36
February.....	13	1	7	..	..	..	1	2	2	26
March.....	17	9	20	2	46	2	8	16	1	121
April.....	4	5	18	..	6	6	2	8	1	50
May.....	7	4	40	1	20	1	..	11	..	84
June.....	5	2	15	..	24	..	..	16	..	62
July.....	1	7	4	..	10	..	..	17	3	42
August.....	1	1	17	..	13	..	..	20	..	51
Total.....	71	34	136	3	119	12	14	94	8	491

The barges from Pennsylvania are doubtless of coal; those from other States were at that time loaded mainly with agricultural products of all kinds, and the grain harvested late in the fall found its way southward during the winter, or as early in the spring as boats could get out of smaller tributaries.

The following statement of quantities shipped from New Orleans, though embracing other articles besides grain, and not showing to what points the 1,353,000 bushels of wheat exported in 1857 were sent, or what quantity was sent to Atlantic ports, nevertheless serves to show that at that period shippers from the West and purchasers from the East, did not discover in the climate of New Orleans and the Gulf, such "climatic influences" as are now supposed to prevent the movement of packed meats and corn by that route:

SHIPMENTS FROM NEW ORLEANS IN 1856-6—1856-7.

1855-6.	Flour, Barrels.	Pork, Barrels.	Bacon, Casks.	Lard, Kegs.	Beef, Barrels.	Whiskey, Barrels.	Corn, Sacks.
New York.....	101,591	60,632	4,124	154,788	14,447	1,762	77,905
Boston.....	200,179	57,624	4,373	122,316	13,998	4,154	195,666
Other Coast Ports..	107,686	35,272	24,648	27,854	7,316	51,656	183,111
Great Britain.....	99,832	9,861	1,900	130,621	4,919	..	1,713,374
Cuba.....	3,447	2,553	1,438	212,771	235	..	5,075
Other Foreign Ports	153,177	17,638	442	94,531	1,594	754	104,799
Total.....	729,142	178,652	37,015	742,817	35,179	58,616	1,676,075
1856-7							
New York.....	141,491	46,628	2,670	183,688	5,517	1,956	26,073
Boston.....	211,166	53,725	2,728	57,373	16,387	8,915	55,322
Other Coast Ports..	141,141	22,721	25,640	19,421	369	47,019	204,618
Great Britain.....	71,758	15,685	4,716	151,611	1,222	..	250,641
Cuba.....	17,774	1,420	1,740	185,061	314	..	59,735
Other Foreign Ports	292,770	4,722	644	49,753	933	1,088	115,235
Total.....	904,810	145,174	38,447	648,866	18,726	60,058	711,623

One of three things is clear; either the people of the States whence these supplies were drawn had no other outlet for their products, or the climate of the Gulf has undergone some marvellous change, or the people who think it impossible to move grain and packed meats with safety by way of New Orleans, may advantageously pay some attention to the history of their country and its commerce. As to other routes, it is enough to state that the Ohio canal (from Portsmouth to Cleveland) was finished in 1832: that the Miami canal (from Cincinnati to Toledo) was completed long before these shipments, as well as the Wabash canal, from the Ohio River to Lake Erie, traversing the State of Indiana; that the Illinois and Michigan canal, connecting Lake Michigan with the Illinois River, was commenced in 1836, and completed before these shipments; that the Wisconsin and Fox River Canal was commenced in 1838; and that prior to 1867 Ohio had 906 miles of canals, Indiana 453 miles, while of railroads Ohio and Indiana had each 1807 miles, Illinois 2,235 miles, Michigan 501 miles and Wisconsin 276 miles, actually in operation. It cannot be imagined, therefore, that the people of those States exposed their grain, or the people of the eastern cities their food, to the dreadful "climatic influences" of the river and Gulf merely because there were no other routes. And meteorological records do not appear, to the unassisted human vision, to indicate that the Gulf region has become within twenty years very much hotter or more humid. The inevitable conclusion is, that people who prate of "climatic influences" have sadly neglected to study the history of their country.

But they have also neglected to observe passing events, as men frequently do who obstinately shut their eyes. Shortly after the war, certain merchants in St. Louis thought it might be well to demonstrate the expediency of shipments of grain to Europe by way of New Orleans. They formed a grain association, purchased and forwarded to England sundry cargoes of wheat, and had them sold in open market there after critical inspection. The following statement of the results of inspection of the cargoes sent by sailing vessels will show whether the injury to grain by transportation via the river and gulf proved to be greater, or conspicuously less than the ordinary injury in shipment by other routes:

	SHIPS.	QUANTITY.	FOUND DAMAGED.
Cargo	Essex.....	14,611 bushels.	30 bushels.
"	Industrie.....	27,586 "	none.
"	Ocean Phantom.....	32,102 "	4 "
"	Johannus.....	23,752 "	none.
"	Emma F. Secor.....	25,757 "	1 $\frac{3}{4}$ "
"	Mary Jones....	13,196 "	46 $\frac{1}{2}$ "
"	Roseneath....	22,170 "	39 "
		<hr/> 159,164	<hr/> 120 $\frac{1}{4}$ "

Shippers by the lakes, by the St. Lawrence, by railroad, or by canal, are respectfully invited to produce any record, at any time, over any route, of consecutive shipments of wheat made during any season, in such quantity, of which only 120 bushels were found damaged upon accurate inspection. Messrs. Budgett & James, of Liverpool, sold the cargoes of the first four vessels, and Messrs. Patterson Brothers & Co. the other three cargoes, and they testify that the wheat of these cargoes was in every case graded higher than the receipts of the same port *via* Erie Canal and New York, or *via* lake and the St. Lawrence, and so much higher that they actually sold for seven and nine pence per cwt. ($8\frac{1}{2}$ to 11 cents per bushel), more than the market rate for American wheat moved by the northern route. Yet these cargoes were all shipped by sailing-vessels, and have been here quoted in preference to shipments by steamer, because the longer exposure of grain in such vessels to any "climatic influence" constituted the severest test that can be desired. One of these vessels met with extraordinary weather—was becalmed under a tropical sun, and afterwards driven far out of her course by a severe storm—and yet her cargo, though ninety days on the voyage, arrived in as perfect condition as any of the grain received at the same time from New York, by sail or by steamer. These cargoes, moreover, were not shipped in the winter only, but through the spring and summer of 1869, and were thus purposely exposed to the influence of the southern climate even more than grain transported—as records have shown it naturally would be with a free route open all the year round, and of unlimited capacity—mainly in the months October to May inclusive. During nearly all of that time the route by canal, or by the St. Lawrence is closed, and though the farmers have more leisure in which to prepare and ship their grain than they have after return of warm weather calls them to plow and plant for new crops, they are at the mercy of railway charges, or buyers who can hold until summer. All grains are more liable to injury in April and May, their natural season for germinating, and during those very months several of the cargoes of which details have been given, were exposed to the imaginary perils of the Gulf route. If, of cargoes shipped at that season and during mid-summer, in sailing-vessels instead of steamers, and then closely inspected, there are found not in perfect condition 120 bushels in 160,000, or one bushel in thirteen hundred, and they sell for eight to eleven cents per bushel *more* than any cargoes shipped by other routes, because of their superior condition, is it not about time for those who talk of "climatic influences" to fortify themselves with a few facts? Evidence of

the statements here made can be obtained by addressing Messrs. Budgett & James, or Patterson Brothers & Co., of Liverpool, and the original records of shipments, inspection returns and sales of the St. Louis Grain Association, can be freely consulted.

But these are cargoes of wheat only, and, perhaps, it may be reasoned, shipments of corn—a grain more liable to injury—may not be made with equal safety. But upon that point, also, any man who has not a strong preference for keeping his eyes closed, can see quite convincing proof in the fact, that shipments of corn by way of New Orleans, to Liverpool, to other foreign ports, and to North Atlantic points, continue to be made every year, in considerable quantity, through all the months of winter, spring and summer whenever freight-room can be obtained, and that no losses from “climatic influences” are known to shippers or receivers—except, as in the case of any other route, when the grain forwarded was unsound before it was shipped. During the year 1872-3 there were exported from New Orleans to Great Britain 651,528 bushels, to Cuba 310,737 bushels, to other foreign ports 167,807 bushels, and to the North Atlantic ports 149,395 bushels—quantities nearly as large as were shipped to the same points before the war. The following statement of cargoes shipped during the months of February to August inclusive, in 1873, needs only this comment, that in every case the cargo arrived in good order, and sold at as high a price as other corn in the market, and in several cases the shippers state that they realized six cents a bushel more than the price for New York receipts on the same date, because of the superior condition of the corn subjected to the “climatic influence” of the Gulf:

CORN EXPORTED IN BULK FROM LIVERPOOL DURING 1873.

1873.	Name of Vessel.	Cargo Corn. bush.
February 11.....	Steamship Cheviot.....	15,000
February 13.....	Steamship Louisiana.....	19,000
March 3.....	Steamship Mississippi.....	12,000
March 31.....	Steamship St. Louis.....	26,000
April 3.....	Brig Geo. Gilchrist.....	15,000
April 8.....	Brig Royal Haven.....	22,000
April 11.....	Steamship Minnesota.....	18,000
April 23.....	Steamship Memphis.....	50,000
April 23.....	Brig Pekin.....	24,000
May 9.....	Steamship Alabama.....	29,000
May 17.....	Steamship Louisiana.....	25,000
June 6.....	Steamship St. Louis.....	16,000
June 19.....	Steamship Mississippi.....	19,000
June 30.....	Steamship Concordia.....	19,000
July 2.....	Steamship Minnesota.....	35,000
August 8.....	Steamship Oberon.....	26,000
August 26.....	Steamship St. Louis.....	22,000

The following statement by a committee of well-known and hon-

orable merchants of New Orleans, with account of the sale of a cargo recently shipped, is copied from a report recently made to the Transportation Committee of the United States Senate :

"Your committee has been informed that serious climatic difficulties are alleged to exist. The frequent repetition of this charge in quarters where there was little interest or opportunity to make denial has given it a seriousness wholly undeserved. We emphatically deny the fact, and assert that no evidence has been adduced to entitle it to serious consideration. Nevertheless, we have been at pains to meet the charge as if made upon full information, * * * * Mr. Higby, the proprietor of the Elevator, furnishes the following account of sales of a lot of corn shipped by him. * * * * Mr. Higby says : 'This cargo of mixed corn was shipped from here June 24th, on the steamer St. Louis. The thermometer stood at 94° the day it went on board, and it had as hot a passage through the Gulf as any cargo ever will have; yet when it arrived, which was in twenty-four days from the time of sailing, it sold at 2s. 6d. over the same grade from New York, as it was in better order.' The consignees, John Stewart Oxley & Co., say 'the corn could not have been in better condition.'

"It was bought at the market rate—67 to 68c per bushel, F. O. B.—and the lot cost \$13,454 08, with \$255 net marine insurance; leaving a profit of \$1,447 60, as it sold for \$15,156 68." * * * *

In the same document a statement by Mr. A. K. Miller is published, which contains the following : "Climatic objections, which have been raised against this route for cereals, are without foundation, there never having been, to the knowledge of the writer, a single case where corn has been shipped in a sound condition, any damage arising during the voyage; but, on the contrary, has been landed in fine order at the port of destination." The document embracing these statements is presented by the following committee: John H. Kennard, A. K. Miller, L. J. Higby, Chas. E. Slayback, J. T. Burdeau, David Hadden, R. S. Howard, J. T. Tucker, William G. Coyle, William M. Burwell, Silas Weeks.

LATEST CORN SHIPMENT FROM NEW ORLEANS TO LIVERPOOL.

"To JOHN H. KENNARD, Esq., *Chairman* :

"We are (November 28, 1873) just in receipt of account of sales in Liverpool of a cargo of corn shipped on steamship Louisiana, October 26th, of 17,479 bushels, which arrived there November 16th, and sold for the highest market price—thirty-four shillings and six pence per (imperial quarter), which netted 65½ cents per bushel of 56 lbs. in New Orleans. This cargo cost 42 cents at St. Louis, and paid 14 cents river freight from St. Louis, and 1 cent transfer charges, with 14 pence ocean freight. Had there been nine feet of water above Cairo, instead of 4½, the river freight would have cost but 8 cents.

"L. J. HIGBY, *President of Elevator*."

As farther testimony upon the same point, the following report, made upon inquiry ordered by the New Orleans Chamber of Commerce, is given :

We, the committee appointed at a previous meeting of this Chamber, to report on the climatic and meteorologic influence of grain shipped through

the port of New Orleans, beg leave to state that we have made personal inquiries of shippers who have shipped grain to Europe, and find all are satisfied with their shipments, and only regret they had not been larger.

In talking with dealers who have stored and held corn in the elevator here, from the first of March till June, and then moved the same to their private warehouses, and still hold the same for domestic consumption, we find it to be in good order, with but one turning with a shovel, which makes seven months' storage in this city. One lot has thirty-five thousand bushels in it. This may be considered a test case, as the weather from March to October is considered the most trying of any months in the year in any city.

Shippers tell us that they have shipped grain which has been stored four months in the elevator during the summer months, to Europe, and it was delivered in good order and sold for the market price.

Other shippers say they have realized six cents a bushel over the New York shipments of same date, on account of the grain being in better order.

We are satisfied, from our own observation, and assurance from others of thirty years' experience at the north and here, that the atmospheric changes are not so sudden or great by many degrees here, as at Chicago.

In Milwaukee, Wis., we have known a whole train of thirty cars of grain to change grade from No. 1 to rejected, in two hours standing on the track, the thermometer varying from forty to ninety degrees in that time. We have known the same in elevators there and at Chicago. Such days happen in May or June.

In the lake cities during the months of April, May, June, July, August, September and October, it is not usual for the same grain to lie in store over fifteen days, as it is all inspected as it goes into the elevator, and the oldest bins of grain are shipped first. Thus, if 100,000 bushels went in daily, in ten days the house would be full, and shipments have to be made to make room for daily receipts.

From experienced shippers of years we are told that it is not often that grain changes grade on the lake in ships' holds, or on the ocean, provided the ship is dry and grain dry when put in, as the grain is under water and the changes of air excluded by closed hatches.

Grain being in a steamship hold from New York to London; fifteen days, and in one from New Orleans twenty-three days, would make no difference, as has been proven to the satisfaction of all shippers. So far as our southern experience test case shows, under our own observation, the cargo of the steamship Memphis was the most trying. Her cargo of 50,000 bushels was in her hold on the bar twenty-seven days, last June, with the thermometer from eighty to ninety degrees all the time; yet when her cargo was taken out o repair her propeller here, it was found in as good order as the day it went in, a sample of which was sent to the Hon. William Windom, chairman of the Senate committee on transportation.

We find the temperature in New Orleans from May to October to be uniform, from 70 degrees in the night to 90 degrees at noon, and little or no fogs, while at Chicago the thermometer varies from 40 degrees to 90 degrees, and fogs are frequent, which will account for the same quality of grain keeping much longer in good order in New Orleans. These experiments prove, so far as climatic influence is concerned, that grain shipped from New Orleans is

drier than that shipped from New York, which accounts for the extra price New Orleans shipments bring over those from New York.

We now come to the climatic and meteorologic effect on grain shipped in barges down the Mississippi River, 1,200 miles, and over the New York and Erie canal and Hudson river, 485 miles. The former takes six days and the latter eighteen days. The former has her deck or roof six feet in the clear, over her grain, with bow and stern open, so that a strong current of air is always passing through and over the grain, which has a continual drying effect, the same as though stored on a barn floor. These barges bring from 20,000 to 60,000 bushels each, and the water in the river is as cool as the lakes. The latter, or canal boat, carries from 6,000 to 8,000 bushels, and is full to her deck or roof, and has no ventilation, which with the sun on her deck and grain close to it, with the dead, stagnant, warm water which she is in for eighteen days, have a tendency and do damage many cargoes during the summer months, even if shipped from Buffalo in good order. This will account for the large amount of corn sold daily in New York, called steam corn, at three to six cents per bushel less than sound corn. * * *

L. J. HIGBY,

J. F. H. GRACE,

J. H. POLHAUS.

NEW ORLEANS, Oct. 7, 1873,

The gentlemen whose names are appended to these reports will be known to members of Congress from Louisiana, as they are to merchants of other cities, as men of high character, and deserved reputation for honor and probity, and it will not be believed by unprejudiced minds that such men have challenged public attention to statements which, if the prevalent impression has any foundation, can be confronted with such facts as an experience of forty years in shipments by that route must have developed. Assuredly, if it were possible to uproot a prejudice, planted in ignorance and watered by hostile interest, this prejudice would be uprooted forever by such facts as have been reviewed. If shipments of grain by way of the Mississippi for many years, continued even from Ohio and Indiana long after canals had supplied means of transportation from the interior of those States and from the Ohio River to the lakes, and thence by the Erie Canal or St. Lawrence eastward, and continued even after three thousand six hundred miles of railroad had penetrated every part of those States, and two thousand two hundred miles had been opened in Illinois, and resumed after years of interruption by civil war, do not prove that grain does not spoil when subjected to the climate of the Gulf; if shipments continued every year, not only across the tropic of Cancer, but across both tropics and the equator, from some countries twice in every shipment, do not prove that grain can be moved with safety in a ship's hold in any latitude or climate, then surely nothing can be established by experience. And

if the critical tests supplied by the shipments of the grain association, and the inspections and sales of the cargoes thus shipped, or the results of regular corn shipments during 1873 and other years since the war, or the condition of the cargo of the Memphis and other vessels long detained in Southern waters, prove that any "climatic influence" whatever exists upon this route, they demonstrate that it must be an exceedingly beneficial and eminently desirable influence, since cargoes subjected to it frequently command higher prices than grain received at the same markets by way of other routes.

There is an influence, not at all "climatic," to which all grain is exposed during the season of germination, when either shipped or stored under such circumstances that the moist air of wet weather can reach it, and it is afterward within effect of the action of the sun's rays for several days. Any grain, so placed at that season, is liable to obey the law of its nature, and begin to sprout. Whether in a railroad car, or in a Chicago elevator, or in a canal boat, when days of damp weather are followed by warm days of bright sunshine, neither the sides and roof of the car, nor the walls of the elevator, nor the roof of the canal-boat, always suffice to exclude the influence of the sun's rays. Then there is "hot corn," and somebody suffers. The grain feels the influence of the sun as well through a thin board as through a layer of earth after it has been planted. It is not the heat which then spoils grain, but that chemical power of the rays of the sun, which is quite as great during the spring and summer in a Northern as in a Southern climate. Heat alone, applied artificially, will prevent the kiln-dried grain from spoiling, but nothing else can prevent it from "heating" in the spring except exclusion from the moist air of damp days and the chemical influence of the sun, or a constant circulation of air around it. Grain will sometimes spoil in a farmers' crib, with air passing freely through it, but rarely. It may sometimes spoil in the airtight bins of a dry ship, shut out completely from changes of temperature, from the moist air of wet days, and from the effects of the sun; but an experience of half a century, if it proves anything, proves that grain is safer there than anywhere else in the germinating season—except in a drying-kiln. It has been known to spoil in a few hours in a closed railroad-car standing in the sun; it has been known to heat suddenly in the best elevators when peculiar changes of weather, more frequent in Northern than in Southern latitudes, have occurred; and it has been known to become so heated in a canal-boat that it could only be dug out with a pick-axe,

while the sale of canal corn, more or less damaged, at reduced rates, is a constant occurrence at New York. So it will spoil if not properly protected, either in a barge or in the hold of a ship. But there are shippers by the dozen, of long experience and ample pecuniary responsibility, who will guarantee against all injury from climate, without any charge in addition to the ordinary commissions for handling, all grain which comes to them in sound condition, and which they can see shipped by a proper vessel via the Mississippi and the Gulf. They may well charge nothing, beyond usual payment for care in supervising a shipment, because they risk nothing. Nevertheless, we shall hear continually of the "climatic influences" of the Mississippi route as long as there are men who have freight-cars to fill, at 50 cts. per 100 lbs. to New York, or propellers on the lakes and boats on the canals to be loaded at 25 cts. per bushel after the crops begin to move.

Why is it, then, that grain is not transported in larger quantities by the river? The full answer, though a very simple one, requires a brief review of facts.

In old times the quantity of grain produced in the States west of Ohio, in excess of their requirements, was comparatively small. As late as 1850 Pennsylvania produced more wheat than any other State in the Union—only fifteen million bushels—and Ohio more corn than any other, ranking second in wheat, while New York was the third and Virginia the fourth of the wheat-growing States. There have been some changes since that time; Minnesota then produced 1,401 bushels of wheat, and now exports a third more than Pennsylvania then produced. Iowa produced 8,000,000 bushels of corn and 1,530,581 of wheat. Thus there was not traffic enough to sustain the modern use of barges, in fleets with tow-boats. One of the modern tugs with four barges would have been able to move all the grain which reached either Cincinnati or St. Louis in a whole year, and yet if every bushel received at either of those cities had been shipped by that one route and those four barges exclusively, they would have had employment only half the year. Moreover, the river steamers then cost less, and were operated at less expense, than was afterwards the lowest attainable cost of building or operating them, and they carried grain at very low rates—in 1852 for only five cents per bushel from St. Louis to New Orleans, the rate never rising that year above fourteen cents. But during that decade the enormous advance in the production of cotton, the "flush times" which prevailed prior to 1857, and the rapid growth of the West and its commerce, habituated the steamers to a different system

of management and a higher rate for freight. The rivers were full of snags and bars; appeals for improvement were little regarded; and the risk of steamboat navigation in such a channel at all times, and the cost of running steamers which were liable to be locked up by low water during a part of the year, prevented the building of boats in sufficient number to keep down rates. The following table shows how rapid was the increase in charges:

HIGHEST AND LOWEST RATES OF FREIGHT CHARGED ON GRAIN IN SACKS AND FLOUR PER BBL., PER RIVER, BETWEEN ST. LOUIS AND NEW ORLEANS, FROM 1850 TO 1860 INCLUSIVE—DISTANCE 1,250 MILES.

	GRAIN PER BUSH.		FLOUR PER BBL.	
	Lowest.	Highest.	Lowest.	Highest.
1850	8	15	18	62½
1851	7	17	22½	60
1852	5	14	20	50
1853	6½	25	20	1 25
1854	9	25	25	1 25
1855	9	35	15	1 20
1856	12½	40	25	1 00
1857	10	32½	25	1 00
1858	10	20	35	60
1859	11½	40	15	90
1860	11	45	18	1 00

This was the critical period in the history of our interior commerce. The Mississippi began to be absolutely necessary, not to the southwest only, with its products of high value per pound, capable of bearing a high cost of transportation, but to the Northwest, with its products of great bulk in proportion to value, in the movement of which the cost of transportation was and is of vital importance. Why did not the demand for transportation of vastly increased quantities, without increase of rates, cause immense increase in the number of vessels built, adoption of new and more economical methods of transportation and handling, and, in short, a development of navigation upon the interior rivers proportioned to the development of industry and commerce requiring greater facilities? There can be but one answer. The capital needed was ready for employment, for at that very period it built railways by the thousand miles yearly. But it was not ready for investment in an employment as uncertain and full of danger as the navigation of interior waters had to that time proved. Precarious as navigation is even now, after many valuable improvements have been effected by Government or otherwise, it was far more so then. Committees of inquiry, raised by steamboat owners had reported that "in very few cases had navigation proved a profitable investment to owners or shareholders; the average of yearly losses by disaster was 20 per cent., and the insurance 15 per cent.;" the uncertainty of finding sufficient water on the bars

exposed owners to loss on any trip, the multitude of snags was a source of constant peril, and the accumulation of wrecks already began to block the channel at difficult places. It is not necessary to ask whether the steamboatmen themselves were at that time prompt to see the necessity for cheap transportation; whether cotton freight, so rapidly increasing in the lower river had not rendered them a little too indifferent to the grain of the Northwest; or whether more might have been accomplished had they, wisely foreseeing that railroads would presently secure most of the passenger trade, sought in their boats economy rather than display, and rivalled each other in low and uniform rates for freight rather than in speed. These questions may be put aside for the very sufficient reason that since the war, when the importance of the Northwestern freight has been well understood, and when the utmost efforts have been made not only by the steamers, but by barge companies also to secure it, the uncertainty of navigation in a stream liable to be blocked as to all economical transportation for several months in the year by low water on a few bars, and its risks from wrecks and snags in the channel, have rendered it impossible to maintain such steady and low rates at all seasons as to secure the desired traffic. Not because the carriers have been incompetent or unwilling, but because, with the present cost of materials and labor, and with the river in its present condition, it has been absolutely impossible to reach rates as low as were obtained twenty years ago, or to maintain regular rates without fatal losses, has the river lost the carrying trade of the Northwest.

But another and very potent influence at New Orleans, not by any means climatic in its nature, has worked with fatal effect. In spite of difficulties in the channel, in spite of the uncertainties of navigation, caused by low water on the bars, rates have been reached, and during the spring could usually be maintained, low enough to secure a considerable share of the grain trade of the Northwest, had there been any sufficient outlet for it below. But the river, impeded at many points, has been practically blockaded at New Orleans ever since the increase in size and depth of ocean vessels, which followed and answered to the demand for cheaper transportation across the Atlantic. Of the bar at the mouth of the river, it suffices here to say that it has rendered New Orleans a closed port for vessels drawing over nineteen feet, and has, in effect, excluded from that port a large proportion of the vessels in which bulky freights are now most economically transported across the ocean. In 1837, in 1852, and again in 1856, spasmodic efforts were made, by authority of Con-

gress, which began to perceive the necessity of opening this port to the commerce of the world. But, though the reports of Government officers repeatedly and expressly stated that no method would be of service without appropriations as steady and regular as those for the support of light-houses, no such appropriations were made, and, consequently, every dollar expended prior to 1860 was practically wasted. With such an entrance, the port of New Orleans is not and will never be entered by ocean vessels in large numbers, except for the purpose of moving cotton—since the high value of that article enables it to pay high freights without deep draught; and the number of vessels entering for that purpose has been, and as long as the present condition of that port continues, will be closely corresponding to the actual requirements of the cotton movement from New Orleans. The few vessels which may at any time fail to get cotton will gladly take grain. But the number of them will never suffice to make that port an outlet of consequence for a commerce as vast in magnitude as that of the Northwestern States. Such an outlet can no more give relief to that commerce than a leak of the size of a pipe-stem can reduce the volume of water which pours over a great dam.

The plain truth is, that neither the government nor the steamboat men, nor the people of this country comprehended, in 1856, the real importance of the Mississippi River to the national commerce. Not even commerce itself saw or comprehended: it only felt, in a blind way, that facilities for transportation were needed. Had any one then declared that of \$150,000,000 which had, even in that one year, been spent in railroad building, more than half had been spent because the nation had not invested \$10,000,000 in opening its great natural highway, he would have met with general suspicion as to his sanity.

Just at that time the excitement of railway building spread over the country, and in 1856 no less than 3,643 miles of railroad were put in operation, and in the years 1850 to 1856, inclusive, no less than 14,656 miles, though the whole number in operation in 1849 was only 7,365 miles. It is commonly said that the crash of 1857 was a warning that we were building railways too rapidly. Every effect has its cause, and the cause of too rapid railroad building at that period was, in plain terms, neglect to improve western rivers. The country had grown so far, and its agricultural production had already extended so far westward, that it was absolutely in need of some other route by water than the lakes and canal had furnished. An attempt to move large quantities by the Mississippi, blocked as

that river was by snags and bars in its channel, and by the exclusion of a large proportion of ocean vessels from its entrance, pushed up rates so high that agricultural products could only be moved profitably by that route from points near the river, and at times of high water. Failure to remove obstructions drove the people of the growing western States, denied all other outlet, to build railroads, no matter at what cost, by which their products could reach the lakes. And then the cost of the roads, and the cost of transportation by routes so expensive, brought a crash, and men said, "we have been building too many railroads." They would have told the whole truth had they said, "we have been improving too few rivers." Nature, insulted, always punishes.

Thus, even before the war, there was proof that the nation could not afford to despise and neglect its great natural highway; that the cost of even reaching the lakes by rail was to its most fertile lands a grievous burden. Then came civil war, closing all channels southward. In the urgent necessity of the hour, railways were again pushed across the country in marvellous number, but at marvellous expense. While agriculture reached forward, by the subjection and cultivation of our richest lands in the far west, to supply our armies, our artizans and our commerce, the railroads welcomed everywhere, as a necessity to such progress, and aided by States, counties and cities, began to move a large part of our agricultural products. Lands were brought into use so far distant from the lakes that the cost of reaching them by rail from such lands made that route more expensive than the all-rail route to the east. If we had war, we had war prices, and while they lasted, the grain of the west could afford to pay for the more costly transportation to which it thus became accustomed. Peace brought only an acceleration of this commercial revelation. A depreciated currency helped for some years to sustain prices. Political excitements engrossed attention. Farmers did not prosper, and mortgages began to multiply, but the people attributed all embarrassments to the high taxes—a legacy of the war which they accepted as a patriotic duty. Not many realized how heavy was the tax imposed by a costly mode of transportation. As population increased, agriculture required new lands, and new railroads to move their products. Every bushel added to the surplus production of the west since 1862 has been moved to the east not by the canals, but by railways. Eastern consumers demanded more grain. Eastern consumers or producers had therefore to build and support more railroads. Nay, even the surplus produced by the older States near the lakes, by which the traffic

by canal was mainly supplied, has greatly diminished, and new lands and new railroads have been needed to meet that deficiency at the East, thus increased. Since 1864 we have built 33,300 miles of railroad at a cost of more than \$1,665,000,000, involving an increased annual tax upon the people, either in loss of productive capital or in cost of transportation, of one hundred millions a year. Let the events of last September decide whether we have not received another warning!

For sixteen years, since 1857, we have slighted the warning then received, and continued to despise the greatest and best gift of Providence to the people of this nation. Again and again, energetic men have tried to inaugurate the movement of bulky western products by the river. Nature has not defeated them; "climatic influences" have helped rather than hindered; but, nevertheless, the Mississippi has been practically closed. Her greatest gifts Nature yields only to those who have the sense to appreciate, and the industry and self-sacrifice to utilize them. If we will have coal or iron, we must dig for it. If we will have free and cheap transportation, we must clear out the highways which Nature has traced. If a route so perfectly adapted to the needs of the most productive region of this continent had been traced, and yet rendered forever useless by natural obstacles which man cannot remove, then the Mississippi river would have been the most stupendous blunder of Nature. But Providence makes no blunders. The only blunder is made by a nation which spends sixteen hundred millions in artificial highways, and one hundred millions a year in maintaining them, when sixteen millions expended in the improvement of Nature's highway, and one million yearly in maintaining it in condition, would have saved fifty times that sum.

APPENDIX K.

A RIVER WITHOUT A MOUTH.

To the industry and commerce of the nation a cheaper mode of transportation than those which now exist, especially for the bulky products of the Northwest, has become an absolute necessity. Improvement of the Mississippi and its chief tributaries offers a mode not only cheaper, but demonstrated by experience, as well as by theory, to be the cheapest attainable by any use of forces now known to civilization. It only remains to inquire by what improvements and at what cost the natural advantages of that route can be utilized.

Let this question henceforth be treated as one not of local, but pre-eminently of national importance. It is not a question whether New Orleans shall prosper as a seaport, or St. Louis or Cincinnati, or any other city, as a center of trade. It is, simply stated, a question whether this nation shall pay, for the transportation of more than six million tons of agricultural products, the cost by rail or the cost by water. Let it be remembered that inquiry has established the fact that the New York canals now move less of grain than the quantity exported, and thus, for four years, the entire demand for home consumption in the Eastern and Middle States has been supplied by rail. Let it also be remembered that, within four years, the complete enlargement of the Welland and St. Lawrence canals will inevitably divert to the St. Lawrence route the entire export trade, unless a route still more economical is opened by way of the Mississippi River. It is, therefore, strictly true that the canals have ceased to be of avail in the domestic exchange of products, and that the only true comparison, for ascertainment of the practical value of an improvement, is not with the cost of transportation by lake and canal from Chicago or Milwaukee, but with the cost of transportation from the districts in which the surplus of grain is actually produced, and from which it goes forward chiefly by rail. The question, then, is whether we shall continue to pay, for the transportation of six million tons of products eastward, more than eleven dollars a ton in winter, and more than nine dollars a ton at the lowest rates of summer, or less than seven dollars per ton throughout the year. It is a question whether the nation shall save twenty millions a year in the

cost of moving products already requiring transportation from the regions adjacent to or beyond the Mississippi, a sum far greater in the cost of moving the quantities soon to be produced by the West and required by the East, and the prostrations of industry and disasters to commerce which want of adequate facilities and use of too costly facilities for transportation render inevitable.

The impediments to the use of the Mississippi River as the national highway for the transportation of bulky freights are, in brief, but two—an outlet partially closed; a channel partially blocked. Of these, the obstacle at the mouth is the more important, since shipments to New Orleans, already possible at high water in the channel, are prevented by the partial exclusion of ocean commerce from that port.

The bar at the mouth of the river became a fatal obstacle to the commerce of the valley in the year 1853. Inspection of the table of grain shipments by river and by lake, will enable any one to mark the very year in which the movement southward suddenly ceased to advance in correspondence with the increase of production in the northwestern States. Other causes, and some of slight importance, continued at that time to check shipments southward. It is not the last feather which breaks the camel's back, but the burden previously increased to the very limit of endurance. So the minor impediments added at that time, served only to prove that the two chief obstacles had already taxed to the utmost the powers of commerce and the patience of enterprise—the bar at the mouth, and the obstructions in the channel of the Mississippi. The depth of water on the bar had not materially diminished. But the depth required for the free movement of ocean commerce had, just at that time, materially increased. Brief explanation will illustrate very clearly, the nature of the difficulty, and the effects, which to this time, are continually produced in even greater measure by the same cause. The following memoranda prepared from treasury reports, show the average tonnage of all vessels built in the United States at different periods; the average tonnage of all foreign and of all American vessels entering all our ports, and the tonnage of such vessels employed in the trade with England.

AVERAGE TONNAGE OF VESSELS BUILT.

	TONS.		TONS.
1840.....	282	1849.....	386
1841.....	349	1850.....	530
1842.....	310	1851.....	556
1843.....	317	1852.....	828
1844.....	329	1853.....	615
1845.....	320	1854.....	754
1846.....	279	1855.....	750
1847.....	343	1856.....	708
1848.....	417		

AVERAGE TONNAGE OF AMERICAN VESSELS BUILT

During the decade ending.....	1820	was	207
“ “ “	1830	“	207
“ “ “	1840	“	279
During five years ending.....	1845	“	341
“ “ “	1850	“	391
“ “ “	1855	“	700

AVERAGE TONNAGE OF VESSELS.

Entering Foreign Vessels.....	1846.	1854
Clearing “ “	168	208
Clearing “ “	167	212
Entering American Vessels.....	265	414
Clearing “ “	264	425

AVERAGE TONNAGE OF ENTERING VESSELS.

	Decade. 1850-1859.	Decade. 1860-1869.
Foreign.....	221	331
“ from England.....	728	1,172
American.....	409	444
“ from England.....	900	1,031

It is scarcely necessary to observe that the higher averages of later years are caused, not by increase in the size of the smaller vessels designed for the less important traffic of the smaller ports, either on the lakes or on the sea coast, for such ports are usually restricted by lack of water to the use of vessels not exceeding a certain size, but by a rapid increase in the depth and carrying capacity of the large vessels employed in trans-atlantic commerce. This change was not confined to vessels of American build. Other nations, defeated by us in competition for the carrying trade, soon discovered that the rapid increase in the carrying capacity of our vessels was the chief cause, and the tonnage of all the English vessels entering our ports increased from an average of 728 tons during the decade ending in 1859, to 1,172 tons during the decade ending in 1869. By this advance of nearly fifty per cent., our vessels were for the first time surpassed in average carrying capacity, and of that carrying trade in which our vessels obtained and securely held the mastery as long as they surpassed those of other nations in average tonnage, about 75 per cent. is now enjoyed by foreign, and chiefly by English vessels. The larger ships can afford to carry at lower rates than the smaller, and can secure cargoes when the smaller go unemployed. Obviously, this change was peculiarly important in the movement of those agricultural products, the low value of which per ton renders cheap freights especially necessary to their profitable shipment. In fact, prior to the extraordinary demand for breadstuffs in England, occasioned by the famine of 1847, the advance in the tonnage of American vessels built had been very slow, as the table shows. But in the very next year (1848) the average tonnage of vessels built rose

from 343 to 417 tons, and in 1850 to 530 tons, and in 1852 to 828 tons. It is something more than a curious coincidence that the movement of grain by way of New Orleans was at that point suddenly checked; for the very vessels in which that traffic can be most advantageously conducted were excluded from that port, went elsewhere for cargoes, and, competing with each other, reduced rates on grain, and left New Orleans dependent upon a class of vessels of lighter draft, by which, at necessarily higher rates, cotton, sugar, and tobacco could afford to pay for transportation, but grain no longer. Data are not accessible for accurate comparison of rates for grain at that time, but with the largest allowance for the greater space occupied by cotton, the following tables show a material difference between the cost of transportation by sea from New York and from New Orleans:

1855-6.	N. Y. to Liver- pool. Grain per bu.	N. O. to Liver- pool. Cotton per lb.	N. O. to N. Y. Cotton per lb.	1856-7.	N. Y. to Liver- pool. Grain per bu.	N. O. to Liver- pool. Cotton per lb.	N. O. to N. Y. Cotton per lb.
	Pence.	Pence.	Cents.		Pence.	Pence.	Cents.
Sept.....	4½ to 5	5-4		Sept.....	8 to 8½	3-8	3-8
Oct.....	12 to 12½	7-8		Oct.....	6½ to 10	-2	7-16
Nov.....	8½ to 9	7-8	3-4	Nov.....	8 to 9	15-32	1-2
Dec.....	10 to 11	1-2	1-2	Dec.....	6 to 7	17-32	1-2
Jan.....	7½ to 8½	3-4	1-2	Jan.....	7 to 8	9-16	9-16
Feb.....	7 to 8	7-2	9-16	Feb.....	6½ to 7	9-16	9-16
Mar.....	7½ to 8	5-8	3-4	Mar.....	4½ to 4¾	15-32	1-2
April.....	4½ to 5	5-8	3-4	April.....	4 to 5	5-16	3-8
May.....	5 to 6	5-16	7-16	May.....	3 to 4	3-16	1-4
June.....	6½ to 7	15-32	3-8	June.....	2½ to 3	5-16	7-16
July.....	9½ to 10	1-4	1-4	July.....	2½ to 3	11-32	3-16
Aug.....	5½ to 6½	7-16	3-8	Aug.....	2½ to 2¾	7-16	5-16
Average.....				Average.....			

Reducing these rates to similar terms, they compare thus:

FREIGHTS ON GRAIN AND COTTON.

		LOWEST.	HIGHEST.	AVERAGE.
1856...	New York— Grain per ton.	\$3.33	\$6.66	\$4.91
1857.....	" " " " "	1.65	6.00	3.30
1856.....	New Orleans— Cotton per ton.	10.00	35.00	22.81
1857.....	" " " " "	7.50	22.50	16.87

The rates from New Orleans to New York, fluctuating from \$3.75 per ton to \$20 per ton, show that another, and by far the gravest difficulty caused by lack of water on the bar had at that time already appeared, namely, want of freight-room. The number of vessels built for the especial traffic of ports of deficient depth is necessarily adapted to the peculiar commerce of those ports. Men having capital to invest in ship building, not especially for the conduct of a particular trade, will naturally prefer to put it into vessels of that form which pays the best. Thus of the vessels not occupied in a particular traffic, by far the greater proportion are of large depth

and capacity. Ports which will not admit the regular and safe passage of the larger vessels, such as are engaged in the general commerce of the world, are mainly confined to the use of the tonnage built especially for their peculiar traffic; and if in any season they demand more, freights must rise, and remain high for some time, in order to attract that class of vessels from other ports in which they have some employment of their own. Cotton can afford high rates, grain cannot. To such a port, therefore, men will not ship much grain, unless they have been able to secure freight-room for it. Thus as long as that class of larger vessels, which may be distinctively called the grain-carriers because they are able to carry at rates more nearly corresponding to the demands of that class of freight, are practically excluded from New Orleans, that port and the Mississippi river are practically closed as a channel for the grain trade. Nor should the fact be overlooked that it is by these larger vessels, which can afford the lowest rates, that freights from ports open to all commerce are practically fixed, and the whole traffic measurably regulated.

The people of New Orleans, anxious as they naturally are for improvement of that port, by no means comprehend the magnitude of the grain trade or its requirements. Thus, in reply to interrogatories from the Senate Committee on Transportation, Captain Decan, a well-known shipper, said, "We have every facility to handle any quantity of grain that may be shipped through this port;" and proceeds to enumerate thirty steamers in the foreign trade. During the last year it appears that one steamer undertook to move as much as 50,000 bushels at once and got aground (drawing 18 feet 3 inches), and was detained fifty days. The average cargo taken does not exceed 23,000 bushels, but the thirty steamers, if each of them took 25,000 bushels of corn at every trip, would about move the surplus corn of one county in Illinois, in eighty days, if they all ran to New York, or in about five months if they all ran to Liverpool. To move the corn actually shipped from Illinois alone, and from that portion only which lies south of the line of equidistance between Chicago and St. Louis, would require more than two thousand trips of such vessels, and the whole number of trips made by vessels of all kinds entering New Orleans during the year ending August 31st, 1873, was 1,291, of which 381 were by steamers. In this connection it is proper to quote the accompanying extracts from the report of the New Orleans Chamber of Commerce:

"Fully two-thirds of this tonnage, if loaded with heavy cargoes to their full draft capacity, would be unable to cross the bar at our river mouth, owing to

the shoal in water during a great portion of the year. Consequently, in the event of taking cargoes of corn, or wheat, they have been confined, in a great measure, to taking half or part cargoes, depending upon cotton or other light cargo for filling up. The same difficulty occurs as to inward cargoes; particularly those from Great Britain. Each cargoes imported from that country to the United States, are almost, without exception, heavy cargoes. Consequently ships bound to this port are obliged to confine themselves to a draft of water in loading, say eighteen feet during winter months, and sixteen feet during summer, owing to stage of water on the bar.

Thus many of our finest ships, whose deep load draft capacity would be from twenty to twenty-three feet, are obliged to confine themselves to limited draft, thereby causing great loss to the ships' owners. * * * The majority of these steamers are fitted for carrying corn in bulk, but are debarred from taking more than half or two-thirds cargoes, owing to objections as previously stated, insufficiency of water on the bar.

Were there a draft of say from 25 to 27 feet, to be depended upon, at the mouth of our river, double or treble the amount of grain would no doubt be shipped from our port—more than at present, to say nothing of the increase that would occur in our steam tonnage, owing to the fact that they would be enabled to load to their utmost capacity, with any cargo that offered."

What can be done to remove this obstacle? It can be and has been partially removed by dredging or scraping. But as yet it has not been found practicable with appliances in use to keep a depth of 20 feet at low water. The commerce of the nation demands upon this route the lowest rates of ocean freight, and consequently the use of vessels carrying 3,000 tons, and drawing (as now generally constructed) at least twenty-five feet. Upon this point the statement of Gen. Humphreys, the Chief of Engineers, in a letter of March 3, 1868, (War Dep't. Part 2, 1868-9, p. 483) deserves notice:

"By this use of the steamer and its appliances, it is expected to obtain a depth of twenty feet at Pass l'Outre, in from thirty to forty working days, and eventually to obtain a depth of twenty-four feet, should such depth be desired.

The bar increases 300 feet in length on the sea-ward side every year, and whenever the normal or natural depth of any part of the bar is increased by machinery or other extraneous force, the river begins to deposit there, and continues to deposit until the natural depth has been restored.

For these reasons the work of deepening must be continuous, and to provide against injurious delays caused by accidents to machinery, and the necessity of docking occasionally for over hauling and general repairs, the construction of a second steamer is essential to the success of the plan. The second steamer, however, provides an excess of force for one channel, and by the addition of a third steamer, operations can be carried on in the two chief passes at the same time, that is, in Pass l'Outre and the southwest pass. The cost of these three steamers would be \$750,000, with an annual expenditure for working and repairs and maintaining buoys and other channel marks of \$50,000 each. These steamers would continually maintain

two channels at a depth of twenty feet, and it is believed that a greater depth can be secured with the same expenditures, that is, from twenty-two to twenty-four feet.

Whatever disposition may be made of the proposed bill, I beg leave to recommend earnestly, that the appropriation asked for the next fiscal year, for the improvement of the mouth of the Mississippi, may be granted."

The experience in use of one dredge-boat abundantly sustained the suggestion of the Chief of Engineers that the construction of a second steamer would be "essential to the success of the plan," for during the year ending June 30th, 1872, prior to the arrival of the second steamer, it appears from the official report that 131 days were lost in repairs, and 109 days from other causes—either because the weather was too rough, or the current too sluggish to move the sediment, or the channel was deemed sufficient for immediate needs. But the recorded depth in the bar equals twenty feet for only ten days in the year, and thirty-five vessels got aground in the pass. During the year ending June 30th, 1873, two dredges were at work, but in November the channel had shoaled to 17 feet, and eight vessels went aground in December, four in January, three in February, and twenty-six in March, not one of them drawing 20 feet. It is stated by the Engineer in charge that the channel was purposely blocked by pilots who were hired to run vessels aground, but if the suggestion of the Chief Engineer, made in 1868, had been carried out, and dredges enough supplied to keep open the Southwest Pass, and Pass l'Outre, at the same time, it would have been difficult to blockade both at once, and the dredging force, concentrated upon either, could have cleared it in a very short time. The immediate necessity seems to be the employment of more dredge-boats; so that the disabling of a vessel will not interrupt work; so that force enough to clear out the channel promptly after a storm may be concentrated; so that one channel, if possible, may be opened to the depth of 24 feet, contemplated in 1868 by Gen. Humphreys, and so that a second channel may at all times be kept open for vessels of ordinary depth, and deepened whenever a blockade occurs on the first. In short, until some measure of permanent improvement can be executed, the dredging force ought to be so increased that there shall be at all times in the main channel as nearly twenty-five feet as possible. If it is necessary to double the force for a few years, the cost will be insignificant in comparison with the results to be attained. The maintenance, repairs, and running expenses, for two boats, is only \$150,000 a year; the original cost of two more would not exceed \$500,000, and the cost of keeping four in service should be less than \$300,000 yearly.

The difference in the cost of transporting wheat alone from only one State would return the original outlay every year, besides paying every year five times the cost of maintaining the four boats in employment.

But as a method of ultimate relief, the use of dredge-boats is at once insufficient and too costly. These boats cannot work in rough weather, when the channel is particularly liable to fill if the winds are from certain quarters, and when the vessels of commerce peculiarly need an open and safe port. It is not quite certain that even twenty-five feet can be kept at all times by dredging; and if so, it is not certain that every future Congress will realize the necessity of a sufficient appropriation: and even then the depth attained is not as great as should be secured, either for commercial or naval uses, at so important a port. Moreover, other methods have been pronounced perfectly practicable by the highest engineering authority, which will secure for all time an ample depth of water, at less cost than would be required in a few years for the continuance of dredging, even with the present insufficient appliances and unsatisfactory results.

For the permanent and complete removal of this impediment to commerce, two methods are recommended to consideration by the achievements of European engineers. The mouths of the Rhone and Danube—the latter under very similar circumstances, and with remarkable success—have been opened to commerce by means of jetties or dykes. From the Mediterranean to the Red Sea, a ship canal has been constructed, in effect shortening the distance between Europe and Asia by thousands of miles, but to create an artificial mouth for the river a canal only seven miles in length is requisite, and the location is pronounced peculiarly favorable to the success of such an undertaking. It is not the province of this paper to attempt any decision as to the comparative merits of different plans. That question will be examined by the United States Corps of Engineers.* It is sufficient here to show that by either method it appears perfectly practicable to secure an ample depth of water from New Orleans to the ocean, and at a very moderate cost. For this purpose a brief statement of the nature of the obstacle to be dealt with is requisite:

The elaborate report of Captain, now General and Chief of Engineers, A. A. Humphreys, and Lieutenant, now Major H. C. Abbott, presented in 1861, has since been recognized as the work of decisive authority on the Mississippi River, and was based upon long continued investigations, more thorough and scientific than any since

* See note at end of Appendix K.

attempted. If it were more generally accessible, a great many commonly received impressions in regard to the cause of this obstruction to navigation, and the proper method of removing it would cease to "darken counsel." It shows that the bar is formed by the meeting of salt water with a current of fresh water bearing along earthy matter. The point at which the salt and fresh water meet changes with the tides and winds; with a strong southerly gale, the salt water "has been known to fill the channels of the passes with an up-stream current;" during the period of flood "the water in contact with the bar, as far as the outer crest, is fresh." But whenever the two come in contact, the fresh water being the lighter must "rise upon the salt water at an angle inversely as the strength of the current." Thus rising, the fresh water ceases to have power to move any further the earthy matter which it has been rolling along the bottom, and that matter "is left upon the bottom in the dead-angle of salt water. A deposit is thus formed, whose surface is along or near the line upon which the fresh water rises on the salt water as it enters the Gulf. This action produces the bar." As the point of deposit changes from hour to hour and from day to day, the bar extends over a distance of 7,500 feet, from its inner to its outer crest, and without material change of form or mean depth of water in its channel, is working forward into the Gulf at the rate of 338 feet each year. In time of floods, the current wears away the inner slope of the bar, detaching and pushing along over the bar, earthy particles which, with lower velocity, the stream had dropped at that point, and thus every year, in addition to the constant deposit, there is a movement of a great quantity of matter from the inner, over to the outer crest, and, as the Gulf is 100 feet deep where the bar is now being formed, the mass of matter moved each year, from the interior to the exterior slope of the bar, is estimated to be 255,000,000 cubic feet, at the Southwest Pass alone, or a mass one mile square and nine feet deep and at all the passes a mass one mile square and twenty-seven feet deep. Upon these forces, constantly at work, tides and winds exercise a disturbing influence, particularly important in this respect, that the prevailing winds from the middle of November to the middle of April are such "that the least depth of water will be found upon the bars of the Mississippi at the time when the greatest number of vessels is obliged to pass over them." This is, in brief, the phenomenon, as explained by the work of Humphreys & Abbot, and these the vast forces, which have, thus far, been permitted to block the commerce of the Mississippi Valley.

The clear explanation of the formation of the bar at once suggests

methods of securing a greater depth of water. The forces of nature here at work are indeed irresistible, but they are mischievous in their power only because man has not had the patience to make them work for him and not against him. The current itself will bear off into the gulf all the earthy matter that it is necessary to remove from the bar, if man will lift the muddy deposit—stir up the mud so that the current may sweep it seaward. But the current itself will do the lifting and scraping as well as the carrying, if by being narrowed and confined its velocity is increased. The same force which, with the moderately increased velocity at times of flood now scrapes up and bears off into the Gulf every year a mass of matter nine feet thick and a mile square, if compelled to work constantly, and concentrated by confinement of the channel, will take away more mud from the bar, and keep open a deeper channel as long as the confinement and acceleration of velocity continues. But, taking up more mud from the present bar, it will deposit more mud somewhere else, and thus will push the point of danger out into the Gulf, and the artificial confinement must therefore be extended. Or, as long as scraping or dredging is relied upon, the work must be continuous, and the yearly appropriations must be as regular as those for the maintenance of light-houses upon our coasts. For the world's commerce will as surely shun a bar of uncertain depth—sometimes thoroughly cleared and sometimes neglected—as an unlighted and dangerous harbor. Either method, therefore, requires constant expenditure. Concerning the great waste of public funds in irregular and spasmodic efforts made in former years, and concerning the proposed methods of improvement, the language of the report of Humphreys and Abbott deserves general attention :

Before making any recommendation on this subject, a brief resume of what has already been done to improve the navigation of the mouths of the Mississippi will be given.

Operations upon the Bars of the Mississippi.—The bars at the mouths of the Mississippi River are always forming, and a perpetual annual expenditure must be incurred to increase permanently the depth of water upon them. In this all the engineers who have written upon the subject agree. The appropriations made by Congress for that object, however, have been given irregularly, and at intervals of many years; so that the deepening of the channels effected by one appropriation has been filled in long before the next. To be of practical benefit to navigation, the depth of the channels must be permanently increased—a condition that never could be attained under the system of appropriations heretofore followed.

When the first appropriation for improving the navigation at the mouths of the Mississippi was passed, in 1837, an extended and elaborate survey of the passes, mouths, and approaches was made by Captain A. Talcott, United

States Corps of Engineers, under the direction of the Board of Engineers, and the plan of deepening by dredging with buckets was recommended.

The plan was approved by the Board of Engineers, sanctioned by the War Department, and carried into effect as far as the appropriation admitted. The plan was based upon the supposition that a work thus begun would be continued by further appropriations, but no other was made until 1852, when the sum of \$75,000 was appropriated, embarrassed, however, with the requirement that the work should be done by contract.

A Board of Officers was then appointed by direction of the War Department, to report a plan of operations.

The Board recommended :

1st. That the process of stirring up the bottom, by suitable machinery, should be tried.

2d. If this failed, that dredging with buckets should be tried.

3d. If both these modes failed, that parallel jetties should be constructed, five miles in length, at the mouth of the southwest pass, to be extended into the Gulf annually, as experience should show to be necessary.

4th. Should it be then needed, that the lateral outlets should be closed.

Finally, should all these fail, a ship canal might be resorted to.

The recommendation of the Board to dredge by stirring up at the bottom was approved by the War Department, and a contract was accordingly entered into for deepening the southwest pass to 18 feet. The contract was successfully executed, and a depth of 18 feet obtained in 1853. No further appropriation was made until 1856, and, as anticipated, no trace of the deepening was left in 1855.

In 1856, \$330,000 were appropriated for opening and keeping open, by contract, ship channels through the bars at the mouths of the southwest Pass l'Outre.

Upon the passage of this Appropriation Act, that Bureau of the War Department having charge of the work invited proposals for its execution by contract, in accordance with the terms of the act, and a Board of Engineers was convened to take into consideration the offers received.

The Board recommended that the proposals of the New Orleans Tow Boat Association to open and keep open the Southwest Pass, by stirring up the bottom, should be accepted, there being no question of the practicability and efficiency of the mode proposed to execute the work; and that the bid of Messrs. Craig & Rightor for opening and keeping open the Pass l'Outre, for five years, should be accepted, for the purpose, as stated, of enabling the bidders, by actual experiment, to prove the practicability and efficiency of the modes by which they proposed to do this work. Their plan was that of closing minor passes, and of constructing parallel or converging jetties on the bars. The Board stated it had great doubts of the practicability of the construction proposed, and of the efficiency of the plan should the work be constructed; but that an important point would be ascertained by its failure or success. Upon the report of this Board, the Secretary of War made the following decision :

If the mode proposed by the Messrs. Craig and Rightor, to open and keep open the passes of the Mississippi, is sufficiently feasible to justify a contract with them for the Pass l'Outre, as recommended by the Board, it is not perceived upon what ground their bid for the southwest pass should be re-

jected, since they propose likewise to open and keep open that pass for a less sum than any other bidder. Should their plan be successful, the appropriation will suffice, on the terms they propose, to secure for five years a depth of twenty feet in both channels. If their plans should prove impracticable, the experience of five or six months will probably demonstrate that fact, and if it should then be necessary to resort to other methods by new contracts, the delay could not be very injurious to the commerce of New Orleans, as the period, December 1st, 1857, at which the preferred bidder for the southwest pass proposed to complete the channel of eighteen feet deep, is so remote, and occurs so late in the season of trade at New Orleans, that the character of vessels destined for that port would scarcely be changed before the succeeding season. Neither is it believed, should it be necessary to make new contracts, that any loss would be sustained by inviting new bids, as those now presented for the execution of the work by tried means are not sufficient, by any combination which can be made of them, to open the passes and keep them open for one year.

The bid of Messrs. Craig and Rightor will, therefore, be accepted for both passes, due care being taken by the terms of the contract, to insure the prompt commencement and steady progress of the work, and sufficient guarantees will be required that the channels will be kept open for the whole period of five years.

Contracts with Messrs. Craig and Rightor were accordingly entered into by the Bureau, for opening both channels twenty feet deep, and maintaining that depth in them for four and a half years.

The duty of the officer of the War Department connected with this operation was limited to marking out the channel to be deepened, and ascertaining, upon notice from the contractors, whether the contract had been fulfilled; that is, whether the required depth had been obtained and subsequently maintained.

The contractors began by building on the east side of the southwest pass a jetty about a mile long, composed of single rows of pile planks, strengthened at intervals by piles. Portions of this jetty were carried away by storms; and the contractors abandoned the plan, convinced that they could not with their means, effect the desired result in that way.* With the sanction of the department, they then resorted to stirring up the bottom with harrows and scrapers, dredging with buckets in some places, and blasting the mud lumps. By these methods they succeeded in June and September, 1858, in opening two channels to a depth of eighteen feet, their contract having been modified that year in respect to depth, and as long as the process of stirring up the bottom was continued by them, the channel preserved the requisite depth.

NOTE BY HUMPHREYS AND ABBOTT.

“Attention should be directed to the fact that the plan of jetties has not really been tried at the mouth of the Mississippi, as the contractors merely built one insecure jetty of a single row of pile planks, about a mile long, whereas the Board of 1852 recommended jetties five miles long on each side of the channel, each 14½ feet wide, composed of piles two feet apart. The plan has been tried, however, at the principal mouth of the Rhone, a delta river like the Mississippi, and has effected the desired increase of depth. The plan was adopted by the French government, after a full discussion of the whole subject by the engineer in charge of the work.”

But in the latter part of 1858, these parties refused to comply further with their contracts to maintain the depth of eighteen feet in the channels for a period of four and a half years; and in consequence of their failure, the winter of 1858-9 passed without any work being done upon the bars. A new contract was entered into by other parties for deepening the southwest pass, but they, likewise, failed to execute it.

The department, in compliance with the appropriation law, having thus opened the work to competition in respect to plans and methods to be used, as well as cost, and having thus failed to secure a continuation of the work, was forced to resort to a contract for the use of steam dredges and machinery, to be employed under the direction of its officers, who, for the first time since 1839, with a remnant (\$70,000) of the appropriation of 1856, conducted the operation of deepening the channels. The plan used was that of dragging harrows and scrapers along the bottom of the channel seaward, thus aiding the river flood in carrying the stirred up matter to deep water. In the low stage that material was transported chiefly by the machinery itself. The plan proved to be successful; and a depth of eighteen feet was maintained upon the bar for the period of one year, at a cost of \$60,000.

Recommendations for improving the navigation at the mouths.—The development of the laws which govern the formation of the bars has removed all uncertainty as to the principles which should guide an attempt to deepen the channels over them. The erosive or excavating power of the current must be increased relatively to the depositing action. This may be done either by increasing the absolute velocity of the current over the bar, or by artificially aiding its action. To the first class of work belong jetties and the closure of lateral outlets; to the latter, stirring up the bottom by suitable machinery, blasting, dragging the material seaward, and dredging by buckets. These plans are all correct in theory, and the selection from them should be governed by economical considerations.

If the excavating power and depositing action of the Southwest Pass had been equal, when the yearly advance of the bar was 700 feet instead of 338 feet, the least depth upon it would have been 21 feet. This increase of excavating power may be obtained by constructing two converging jetties, beginning where the depth of 22 feet is found, and extended to that depth outside the crest of the bar, which should give them a length of about 2.5 miles. The experience gained in the progress of the work should determine where the convergence should cease and the parallelism begin. The erosive action should be aided at first by dragging and scraping the hard portions of the bar. The depth of 21 feet thus obtained must be maintained by the annual extension of the jetties 700 feet into the gulf, and the reduction of the mud lumps by suitable machinery whenever they begin to appear. This rapid extension of the mouth of the pass into the gulf would tend to increase the volumes of the shorter passes at the expense of its own, and it would eventually be necessary to resort to another pass for the continuation of the plan.

The plan of stirring the bottom by dragging harrows or scrapers over the bar is, no doubt, the most economical and the least objectionable. As already shown, during the low-water stage and part of each transition stage, there is often dead water or a reflux current on the bar. The operation should therefore be limited to the flood stage, during which there is an outward current on the bar. This stage, it will be remembered, usually con-

tinues about six months in the year, but its exact duration in any season may be readily determined by observing the oscillation of the river at Carrollton, where its commencement reads about 11.0 feet on the delta survey gauge. After the remarks upon the frequent variations in the mean level of the gulf, it need hardly be added that no exact estimate of the progress of the work can be formed without careful daily gauge observations at the pass itself.

In conclusion, it should be stated that no plan whatever will prove of any material benefit to navigation unless a permanent fund be provided, untrammelled by restriction as to the mode of expenditure, from which a sufficient sum annually can be relied upon for the continuous prosecution of the work, after as well as before the channel has been opened to the desired depth. The bar is constantly forming, and must therefore be constantly removed.

In this review certain points are worthy of especial notice :

I. That the question is simply one of cost, either method of securing a desired depth being perfectly sound in theory, depending upon the operation of fixed laws of nature, and certain to accomplish the result if the sum required is furnished.

II. That the method of confinement of the current by jetties has not been tried, though its certainty of action, if the needful works can be constructed and maintained, is conceded. The questions whether such jetties can at that point be economically constructed, and what yearly outlay will be necessary for extending them, have not been answered by experience.

III. That in the report of the Board of 1852, a ship canal is named as the last resort, of the success of which, should all other methods fail, there need be no doubt. This method has already been warmly recommended by Capt. Howell, the U. S. Engineer now in charge of works at that point. Touching its expense and advantages, he declares :

"There is no doubt of its feasibility. It will probably cost \$7,500,000. It will be seven (7) miles in length. It will have but one lift-lock, and that with only a lift of from one to six feet; the latter varying with the stage of the river.

No river water will be admitted into the trunk of the canal.

The canal will admit to the port of New Orleans, vessels of the greatest freighting capacity, in consequence cheapening freights on cheap and bulky goods.

It will have the effect of reducing tonnage charges fully one hundred per cent. below the present charges.

It will admit vessels without delay.

It will be a work of permanent improvement, as such inspiring confidence in commercial ventures to this port, and free from the uncertainties attending dredging, viz: Effects of storms, careless pilotage or towage, suspension on account of breakage of machinery, or, what would be more, on account of failure to make appropriation.

It will place New Orleans on a footing with the most favored port in the United States, as regards depth of entrance, and on an equality with the principal European ports with which she trades.

It will give the Valley of the Mississippi an economical and certain route to the sea, at all seasons of the year.

I believe this covers the points you made.

Very Respectfully, your ob't serv't,

C. W. HOWELL,

Capt., Engineer U. S. A.

Seven millions and a half is a large sum. But if it will secure free entrance at all times for the largest vessels of commerce to the Mississippi River, it will save ten cents a bushel in the cost of transporting to the eastward at least seventy-five million bushels of corn now moved from lower Illinois and the States west of the Mississippi River, which, without other improvements in the channel of the river, could be moved southward in its natural season, the winter and spring. Thus the investment would pay 100 per cent. in a single year.

The experience of European engineers in improvement of the mouths of the Rhone and Danube prompts inquiry whether it is not practicable at even less expense to make the Mississippi dig its own ship canal, and keep it open perpetually. The mouths of the Danube have formed, by alluvial deposit, a delta like that of the Mississippi; the character of the bottom, and of the material to be removed was similar; the pass which has been successfully improved was much more shallow than those of the Mississippi, and the natural force of current afforded for clearing away the obstruction much smaller. But by means of two jetties, at first curving toward each other, and then moving out in parallel lines, the current was somewhat confined; the velocity was thus increased, and the current cleared away the very mud which the weaker stream had deposited; and thus a channel originally of nine feet was permanently deepened to twenty feet. An enormous increase in the commerce of the port at once resulted, rates of freight were reduced fully one-half, and disasters and detentions formerly frequent, wholly ceased. The details of the cost of this work seem to indicate that upon a similar plan works narrowing the discharge of the Mississippi at the bar could be constructed at a cost considerably less than that of the ship canal. But as to the comparative availability of these or other methods, and of the ship canal, a scientific examination must determine. It is sufficient here to say that engineering experience leaves no room to doubt that by either method an entrance to the

river sufficient for all the wants of commerce can be formed and maintained at a cost much less than the sum saved each year in the transportation of Western products by routes naturally more costly and far less accessible to the regions from which those products are chiefly moved.

Since the first edition of this Memorial and Appendices was printed (January 12th) the report of a Board of Engineers convened by order of the Chief of Engineers, to examine and report upon the plan of Captain Howell, made to the department, (under date January 9th) has become public. A majority of the Board believe that the proposed Fort St. Philip Canal is practicable, but "in order to avoid beds and pockets of quicksand known to exist at some points in this locality, that the precise line of the canal should not be decided upon until a more thorough examination of the sub-strata has been made by boring." They further state that the details of the project have been so imperfectly prepared that "the estimate submitted can only be regarded as an approximation to the probable cost of the work," and they "entertain doubts of the practicability" of the method of construction proposed for the lift-lock, "owing to the nature of the soil and the engineering difficulties consequent thereon." They further recommend a modification of the plan so that only 25 feet depth over sill would be allowed, and of the canal, thus reduced in depth and utility, estimate that the cost will be \$10,273,000. From this report, General J. G. Barnard, President of the Board, dissented, giving as his reasons, first, that the plan for the canal is "not a sufficiently complete study of the project;" that "more comprehensive study is required to fix the location and determine the *general* details of construction, and to make an estimate which can rightly be considered *approximate*." He further gives at length reasons for the opinion that the settlement of the lock foundation, in a soil of such character, can be prevented only with difficulty; and that "the sinking of the extensive masonry masses to a depth of more than forty feet below the contiguous river-surface, is something which has no actual precedent in Louisiana, and demands the most careful study before undertaken." In a subsequent report, (dated January 29th) General Barnard examines and strongly recommends the plan of deepening the natural mouth of the river by jetties, gives details of the work accomplished by European Engineers in deepening the Sulina mouth of the Danube, argues forcibly that the apprehension of rapid protrusion of the bar into the gulf, in case of the construction of jetties, has been much exaggerated, and

reasons that the cost of improvement by this method "will be a small fraction of that of the canal," adding:

"The advantages of an open river mouth are inestimable. The needs of a navigation so great as that which now exists, and which in the future of the great Mississippi Valley must be fifty-fold increased, demand it."

"It is said that 'the time has come' when the needs of commerce demand the canal, but I answer that *the time will come* when there will be the same cry for a navigation unimpeded by locks—*an open river mouth*—which we now hear for a canal. But in whatever aspect the question be regarded, the use of the river mouth for the next ten years is simply inevitable. * * * It would be a rash confidence which would contemplate a realized Fort St. Philip Canal earlier than A.D. 1884."

These reports, placed before the Committee of the House of Representatives, produced an impression strongly unfavorable to the canal project. The favoring report was regarded as much too indefinite and vague, while the objections of General Barnard produced a great effect. The Committee finally decided not to recommend the canal project, on the ground that the Engineer's report was unsatisfactory. Meanwhile, Capt. Jas. B. Eads, of St. Louis, justly distinguished by his services as an engineer in the construction of iron-clads during the war, and by the successful completion of the great bridge over the Mississippi at this city, together with associates of ample financial ability, made a formal proposition to undertake the deepening of the mouth of the Mississippi by means of jetties, without any aid from the government until certain specified results should be secured. This proposition, having been received with much favor by members at Washington, was considered at a meeting of the Union Merchants' Exchange, of St. Louis, held on Saturday, February 21st, and the following resolutions, unanimously recommended by the Board of Directors, were unanimously adopted by the Exchange:

WHEREAS, the most imperative need of the West for the promotion of its commercial interests, is an increase of facilities for cheap transportation to the seaboard: and

WHEREAS, the most efficient means to this end, is the deepening of the channel of the Mississippi at its mouth, so as to secure at New Orleans a constant and regular supply of ocean tonnage from all the ports of the world; and

WHEREAS, this Exchange issued a Memorial to the United States Congress, urging the importance of deepening of the mouth of the Mississippi, in which allusion to the improvement by a canal, and also by jetties, was made, and there having been a report from the Board of United States Engineers on this improvement, from which it is evident that the plans, location and details of construction of a canal are not matured, and that the completion of the canal will be a matter of great uncertainty; and

WHEREAS, James B. Eads, in behalf of himself and associates, has submitted a proposal to Congress for the deepening of one of the passes of the Mississippi River, into the Gulf of Mexico, the substantial features of which are:

1. The depth to be secured is 28 feet, the width of the channel shall be at least 600 feet, and the work to be commenced within six months.

2. The total compensation for securing this depth shall be \$5,000,000.

3. A depth of not less than 28 feet shall be maintained constantly for ten years, thereafter, and for this service there shall be paid the sum of \$500,000 per annum in quarterly instalments.

4. When twenty feet in depth shall have been obtained \$1,000,000 shall be paid, and as much additional increase of depth of two feet shall be secured an additional \$1,000,000 shall be paid.

Provided that no payment whatever shall be made until four months after twenty feet shall have been secured, and uninterruptedly maintained in said channel.

5. The payment of \$500,000 per annum, is to depend solely upon maintaining continuously at least 28 feet in said channel, and it is only to be paid after such fact is satisfactorily certified to the president, who is to appoint officers, or commissioners to examine the work from time to time, and payments are only to be made when they shall certify that the several amounts are justly due; and

WHEREAS, the following resolution, with others, relating to the improvement of our rivers, was unanimously adopted by this Exchange, and submitted to the congressional convention which assembled in this city last June, to-wit:

"That while those improvements can be successfully carried forward under the direction of able engineers of the government, in whose talents we feel a just pride, we would suggest for the consideration of Congress, the propriety of having such portions of it executed by contract, as can be let to responsible parties, willing to guarantee desirable results for reasonable compensation."
And

WHEREAS, by the proposition of Mr. Eads and his associates, the cost of this much needed improvement, is far less than the estimated cost of either of the jetties or the canal, according to the recent report of the Board of United States Engineers, on the Fort St. Phillip canal; and as we have the fullest confidence in the ability of Mr. Eads to execute successfully the proposed works, and within a less period of time than that required for the completion of the canal; therefore be it

RESOLVED, that the proposition of Mr. Eads and his associates is recommended to the favorable consideration of Congress, and that it is the opinion of this Exchange, that its acceptance will secure, on terms both safe and advantageous to the government, the earliest attainment of a convenient and reliable deep-water channel between the Gulf and the river.

APPENDIX L.

As the opening of the mouth of the Mississippi is of the first importance in a comprehensive plan of relief, the preparation of the main trunk for economical navigation, and then of the chief branches, will follow in natural order. The time has come for the people of the Mississippi Valley to insist that the main stream and all its navigable tributaries shall be fitted for the use of national commerce, each in due order and measure, according to its needs and its importance in the great route of which it forms a part. What portion of this work can properly be undertaken at once, it is the province of the representatives of the people to consider.

Honor and thanks must be rendered to the Government of the United States for perceiving the need of improvement of these navigable waters, and commencing it at important points. It is but just, also, to observe that the corps of engineers has continually recommended improvements upon a comprehensive plan, and asked the appropriations needful for prompt completion of works undertaken. Since the absolute necessity of immediate relief for the commerce of the country has become so evident, it is hoped that henceforth, when Congress has undertaken a work, there will be no wasteful indulgence of mistaken economy in refusal to supply funds necessary for doing the work in the most prompt and economical manner.

There is peculiar need for the completion, at the earliest possible moment, of the canal around the Des Moines rapids. It has already been shown that the obstruction at that point is in effect an absolute blockade of the river as to all traffic, to which low rates are necessary, for a large part of the year, during which it imposes a tax of not less than two dollars per ton upon the large commerce which nevertheless continues to use the river in that season. Moreover, the same obstruction renders it practically impossible to use the river for the southward movement of wheat after the crop of Minnesota, Wisconsin and Northern Iowa has been harvested, and deprives the wheat-producers of those regions until spring of all use of their natural route. It takes from the transporter by far the greater part of the traffic which he might with an open channel secure in that region, and thus compels him to charge, upon whatever business he can

obtain during the year, rates sufficient to cover not only the cost of months of entire inactivity, not only the risks of a transportation liable to be thus interrupted at irregular times; not only the cost of transfer of cargoes actually moved past the rapids at low water; not only the cost of keeping at that point throughout the year the men and boats for such transfer whenever it becomes necessary, but also the cost of providing facilities for doing a large business at high water, though at low water the business which can be obtained is quite insufficient to employ those facilities. Transportation under such circumstances bears and must impose upon producers or consumers burdens far beyond the cost of moving freight if the channel were uninterrupted. It is not possible to state with statistical accuracy the magnitude of this burden, but by one line only more than \$2,200,000 has been paid as the cost of transfer of freight actually moved past the rapids in one year, while 230,000 tons exclusive of all way-freight was by that one line moved during the year 1873, every charge upon which was necessarily increased in consequence of the cost, risk and interruption of navigation. The producers of not less than fifty million bushels of wheat, beside other cereals, have been deprived, during the fall, of access by a natural route to markets below the rapids, and yet the same delay has materially increased the cost of the work to the Government. As an illustration of the effects of appropriations by piecemeal, the following extracts from reports of the engineer corps will be instructive:

REPORT OF CHIEF OF ENGINEERS, OCTOBER 20, 1868.

"Amount appropriated, June 23, 1866, \$200,000; March 2, 1867, \$500,000; amount required for the completion of the work, \$1,480,000."

REPORT OF GEN. WILSON, ENGINEER IN CHARGE, AUGUST 15, 1868.

"For the entire and permanent completion of this work, the sum of \$1,480,000 in addition to the \$700,000 already appropriated, will be required.

* * For the year ending, June 30, 1870, the sum of \$1,480,000, *the entire amount necessary to complete the work, will be required.*"

REPORT OF CHIEF OF ENGINEERS, OCTOBER 25, 1870.

"Owing to the pressing and peculiar wants of this work, an appropriation of \$200,000 was made by congress in December, 1869, to continue operations. * * The act of July 11th, 1870, appropriated \$400,000 for the continuance of the work. * * Amount required to complete the improvement over previous appropriations, \$810,000, which sum could be advantageously expended during the fiscal year, ending June 30, 1872."

REPORT OF GEN. WILSON, ENGINEER IN CHARGE, JULY 10, 1870.

"I desire again to call attention to the fact, that the completion of the body of the canal without the middle and guard locks, will be of no advantage to the interests of navigation. Should congress make a sufficient appro-

priation at the commencement of the next session, *the entire work could be completed before May, 1872; otherwise it will be impossible to say when this result may be expected.*"

REPORT OF CHIEF OF ENGINEERS, OCTOBER 19, 1872.

"**LOWER LOCK.**—The construction of this lock was pushed on with great vigor, *as long as the funds available would allow.* * * **MIDDLE LOCK.**—Work ceased on this lock Sept. 9th, 1871, *from want of funds.* * * **SECTION WORK.**—*Only one month's work was done upon this portion of the canal, July, 1871, owing to want of funds.*"

REPORT OF ENGINEER IN CHARGE, AUGUST 1ST, 1872.

"Balance required over previous appropriations to complete the work, \$1,323,481.19. * * In case of continued small appropriations, there is no doubt that it will take several years to complete the work, and the expense to the Government will be largely increased on account of the evident damages which will occur to the work from its incomplete state, arising from leaks in the banks, slides from unprotected portions, and other points which have been mentioned in previous reports. In case that Congress should see fit to make an early and large appropriation during the coming season, equal to the balance of my estimate at present prices, I have no doubt the work could be placed in a fit state for boats to pass, and navigation kept up throughout the year, except when the canal might be frozen."

REPORT OF PROCEEDINGS OF A BOARD OF ENGINEERS CONVENED AT KEOKUK, IOWA.

"The Board respectfully calls the attention of the Chief of Engineers to * * letters and reports now on file from the various officers in charge of these works, at various times, *concerning the increased cost of labor and materials, if partial appropriations only are made.* The members of the Board * * would state that in partial appropriations lies the great cause for increased cost over the original estimates."

It is probably unnecessary to add that this improvement which, according to the official reports, could have been finished, at less cost to the Government than the sum expended, before June 30th, 1870, is not yet completed, and, while the Government has been throwing away money by thus paltering with a work it had undertaken, the producers of the Northwest have lost a sum which can only be estimated in millions, by four years of needless delay. If there is any excuse for this waste of public funds, and trifling with public interests and the necessities of commerce, there are many tax-payers in the Northwest who would be glad to hear it.

Next in importance, of improvements upon the main trunk of this route, are those already commenced and recommended by the engineer in charge, between the mouth of the Missouri and Cairo. Over this part of the route the traffic is now much larger than over any other which is greatly obstructed, and the existing impediments

are peculiarly injurious in effect. Below St. Louis, navigation changes its character; boats of larger tonnage and deeper draft are required; the bulky cargoes brought down in light-draft boats or barges are thence moved southward more economically in boats or barges of large tonnage. A depth of eight feet at low water is the least that will serve the absolute needs of this commerce, but upon some bars between St. Louis and Cairo the river shoals nearly every year to about five feet, or even less, at times practically stopping navigation altogether. This part of the route has not only its full share of the great through traffic, but also a very large traffic which uses no other part of the Mississippi, namely, the movement of coal and iron ore between St. Louis and the great coal fields of Illinois, and between St. Louis and the iron works of southern Ohio and of Pittsburg. The condition of the channel of this part of the river affects the prosperity not only of producers and consumers above it, but also of manufacturing establishments in Missouri, Pennsylvania, and all the intervening States.

In this even more than in any other part of the Mississippi, the channel is greatly obstructed by snags, of which the Missouri brings down multitudes every season, which naturally lodge in disproportionate number upon the nearest shoals after reaching the Mississippi. These dangerous obstructions not only cause the sinking of many vessels, but compel the building of stronger and more expensive vessels for navigation below the mouth of the Missouri than would otherwise be necessary, prevent the general employment during the winter of up-river boats of lighter build in the lower river, tend to fill the channel and make it crooked by lodging in shoal places, and thus add not a little to the cost of transportation by river. For their removal from Western waters the Government provided, by appropriation made in 1866, a few well-adapted boats, which have rendered valuable service. But the force employed is insufficient for the requirements of commerce, and it should be so far increased that not only the snags but the sunken wrecks, of which many encumber the channel, may be speedily and thoroughly removed. Having been for twenty years neglected, and at many dangerous places obstructed by the sinking of vessels, the stream needs a thorough and somewhat costly clearing out, and the great benefits already realized from the services rendered thus far at trifling expense, serve to show that public funds can in no other way be so expended as to secure a larger public gain. For belief that the thorough clearing of the stream is practicable, and that, when it has been once effected, a small yearly appropriation will suffice to

keep the channel free from these obstructions, we find authority in the official report, September 20th, 1870, of the engineer then in charge, Col. J. N. Macomb, who said :

"For twenty years prior to my assignment to duty upon the western rivers, there had been nothing done in this line of improvement. The old snag boats had been sold, or had gone to destruction, and it became necessary to build new boats and organize the work anew. This was done with the aid of such information as the records of the engineer department afforded. * * In my several annual reports showing the progress of this work, I have submitted such estimates as I thought were justified by its magnitude. I regret that they have not been fully responded to, for our operations have proved that by such an expansion of the works as I have heretofore contemplated *the western rivers could be cleared of snags*, and this once done, it would require a comparatively moderate annual expense to keep them clear for the future. Especially is this the case in view of the advancing settlement of the river borders."

REPORT OF LIEUT. COL. WM. F. RAYNOLDS, AUGUST 12, 1872.

"The necessity of making some provision for the continuance of the operations of the snag boats, by building new boats to replace these we now have has been repeatedly urged.

The time is fast approaching when new hulls must be provided or we shall have no boats. The item of repairs has already become so great as to absorb a large part of the appropriation. Water-logging and extra timber to keep up strength, has added six inches to their draught of water. I am satisfied that nothing but iron hulls will give us the boats we want. * * An appropriation for this purpose is most urgently recommended. The appropriation for the improvement of the Mississippi, Missouri and Arkansas Rivers, made by act of Congress, approved June 10th, 1872, was \$90,000. The condition of the fleet is such that I have recommended, and the department has approved, setting aside the sum of \$40,000 of this sum, to commence building an iron hull for one of the boats. This leaves but \$50,000, with the balance of the previous appropriation, for running the fleet during the year. The cost of all the boats in commission cannot be estimated at less than \$20,000 per month, which would consume all our funds in about three months."

These official statements show fully both the utility of the work, and the inadequacy of such appropriations as have at times been made, even for its continuance. But commerce needs that complete removal of these obstructions which Col. Macomb recommended in 1870, and for which the officer now in charge, Maj. C. R. Suter, has submitted detailed plans in his report of October 20th, 1873, from which the following are extracts :

"Two boats will be put in the field this season. They will work three months in the Missouri, and four in the Mississippi. This is the longest period of field work which can be allowed, as the expenses of the boats in commission and in ordinary, with the sum required to complete the iron hull, will exhaust the appropriation. Even the expense of the repairs, which will

be required at the end of this season of operations, must be paid from the next annual appropriation.

I must, therefore, call the attention of the Department to the absolute necessity of an increase in the annual appropriations for this work, at least until we can get out our new fleet of iron boats. The cost of the one now building is to be paid from the current annual appropriations for two seasons, which leaves us so crippled for working-funds as to render it impossible to do more than a small fraction of the work required. About all I can hope to accomplish this season, will be to prevent snags from accumulating in the Mississippi River."

The report then explains the cause of these obstructions, and the efforts made to prevent the continuance of the evil, by cutting down the trees near to such portions of the banks of the river as are washing away. He then says:

"If this scheme could be carried out in a comprehensive manner, the work would be narrowed down to destroying the 'rack heaps' and removing the snags which are already in place as fast as they appear. A few seasons of vigorous work, with suitable boats, would reduce the business to such small proportions, that an occasional trip over the river by a snag-boat would answer all purposes.

Such a scheme, would, of course, be costly, but not unreasonably so, and would be economy in the long run. As to its feasibility, there is not the slightest doubt. An absolute prerequisite, however, is that proper snag-boats should be provided. A step has been made in this direction by the iron boat now building. Two more should be commenced as soon as possible, one to be of the same size as the one now building, the other of considerably smaller dimensions, for service in the small streams; eventually, two more of the small size will be required.

Other very material obstacles to navigation are the wreck of steamboats profusely scattered over the whole extent of the navigable streams of the West. These must be removed, as they are even more dangerous than snags, being larger and more unyielding. For their removal, I should recommend using one of the present wooden snag-boats, which, with some additional machinery, would answer the purpose admirably. Supposing the full fleet of boats to be available, it would probably require about four years' labor of the entire force."

The plan, of which detailed estimates are submitted, involves work for six years, with cost of boats and machinery, and an entire expense of \$600,000 for proper boats, and \$192,000 for each year. After six years, it is stated, "the annual expense would probably be about \$100,000. It is believed that the construction of the snag boats proposed, are, in any event, absolutely necessary, while in regard to the cutting of timber from the banks, it is possible that the appropriation and labor may be made to serve a double purpose, presently to be mentioned.

The nature and number of the shoals between the mouth of the Missouri and Cairo, with the cost of securing a depth of channel

sufficient for navigation at all seasons, are clearly stated in a letter from the engineer in charge, Gen. J. H. Simpson, dated October 29, 1873, from which the following are extracts :

"The general principle that may be laid down for the improvement of the Mississippi, is, 'To collect all the waters into a single channel of moderate width.' If this be done, I have no hesitation in saying, that instead of the ruling depth from four to five feet now existing at low water, a depth of ten feet can be maintained as a minimum at all stages, below the mouth of the Missouri, because that depth of channel is now found wherever the river has a width of water-way less than twenty-five hundred (2,500) feet, at low water.

In saying that this is the cardinal principle for the improvement of the river permanently, I do not wish to be understood as saying that the navigation can be improved in no other way, but that this is the best for the Government to pursue, because it is the only certain and lasting way. * * *

"There are upon the list in this office twenty-two shoals between St. Louis and the mouth of the Ohio river, of which ten are noted as having been at various dates serious obstructions, the depth of water at the lowest stage of the river over these bars being as little as four feet, though the bad bars of any one year are fewer in number, as has been stated before. The bad bars act as dams and pond back the water over these above; therefore, as the worst bars are improved, we must expect others to come into prominence, and thus in succession until the whole section of river has been improved; whence an argument for regular and liberal appropriations and a systematic prosecution of all work as parts of a complete plan, is so palpable that it does not seem necessary to enlarge.

"In conclusion, I will state, that a survey of the river from St. Louis to Cairo, with a view to its permanent improvement, has been in progress during the present season, and at this date has reached a point within about 45 miles of the latter place. Already a rough estimate of my predecessor, on a previous imperfect survey, has made the probable cost of improving the river between the mouth of the Missouri and the mouth of the Ohio rivers two millions nine hundred and ninety-six thousand dollars (\$2,996,000), and until a more thorough estimate can be made, based on the more complete survey now in progress, we must content ourselves with this approximation."

The sum named, for the thorough and permanent improvement of two hundred miles of the largest and most important river in the country—only fifteen thousand dollars per mile—though a large sum in the aggregate, appears inconsiderable when contrasted with the cost of these impediments to the commerce of the country. Ten feet of water, which General Simpson "has no hesitation in saying," . . . "can be obtained as a minimum at all stages," is now regarded as "high water;" it is abundant for all the uses of commerce as now conducted, and justifies high water rates. The difference between rates at high and at low water is shown by the following table of actual charges for flour and grain from St. Louis to New Orleans :

RATES MONTHLY—ST. LOUIS TO NEW ORLEANS.

MONTHS.	1870.		1871.		1872.		1873.	
	FLOUR, per Barrel.	GRAIN, per 100 lbs.	FLOUR, per Barrel.	GRAIN, per 100 lbs.	FLOUR, per Barrel.	GRAIN, per 100 lbs.	FLOUR, per Barrel.	GRAIN, per 100 lbs.
April.....	35	17½	25	15	65	32½	35	18
“	25	15	25	15	65	32½	3	18
May	25	15	25	15	60	30	3	15
“	35	17½	25	15	60	30	35	15
June.....	45	27½	25	15	30	17½	25	12
July	45	27½	30	17½	30	17½	25	12½
August.....	55	30	60	35	30	17½	35	17½
“	55	30	60	35	40	22½	35	17½
September.....	65	35	65	35	45	22½	60	30

Other months in the year “low water rates” prevail; those of September or even higher, according to the condition of the channel.

The difference, it will be apparent, is a very important one—not less than 17½ cents per 100 pounds, and in some years 20 cents. The removal of these bars, as recommended by General Simpson, if it had no other effect, would at least render practicable during the whole year the rates now maintained at high water. Of one million tons of freight received from and shipped to the lower river in 1873 at this point, about half was moved during the high water months. A charge of 17½ cents per 100 pounds in the cost of transporting the remainder (about 500 000 tons) would be \$1,750,000 yearly, and thus, considering only the present commerce at this point, the proposed improvements would pay for themselves in less than two years. And when their cost is considered with reference to the vast commerce now debarred from using this, its natural highway to the sea, by means in part of these same shoals, it appears utterly insignificant.

Nevertheless, if by any method the same results can be secured at less cost, the economy is desirable. In many localities also the construction of dams by the methods ordinarily adopted is not only expensive, but is liable to give trouble, for a reacting eddy behind the dam sometimes cuts away the bottom under it, and causes it to sink, forming a new obstruction more dangerous than any shoal. For the improvement of a stream having so treacherous a bottom and such power of current, another method seems worthy of consideration, as offering in some cases greater permanence as well as economy. This method, suggested by the experience of practical river men, is to use the very trees which the snag-boats are now cutting, by the thousand every year, from the banks of the river, and the snag-boats or others with similar machinery for hoisting large trees, in the construction of artificial “rack-heaps” at the points

where it is necessary to confine or change the current. The method is simply an application of the principle upon which nature has formed hundreds of the most obstinate obstructions in the river; a floating tree lodges, its branches check the current and cause a deposit of sediment behind and finally around it. A succession of trees, anchored in the required position to confine the current to a desired channel, will have the same effect. More than twenty years ago this plan was suggested by one of the oldest pilots on the river—Mr. C. M. Scott—in a communication published with the endorsement of some of the most experienced and skillful river men of that day, which is here copied:

“Having boats with machinery capable of hoisting the largest trees, and large rock, from 1,500 pounds and upwards to as large as can be handled, prepared with large chains, long enough to go round the butt of the largest tree, tow to the first large tree growing near enough to be cut into the water. Fell it, hoist it so that it can be towed or floated to the point of commencement, which ought to be under a point or in slack water. Drop the anchor as close to the shore as possible, letting the top swing with the current, and revet it close to the shore. Then take a second tree, and anchor in the same manner, and so on to the end. When first starting out from the shore, the main line of the dam should run at right angles with the main current. As it advances into swifter water, slope it down with the current. It may be necessary to place two rows of trees where the dam meets the strongest sweep of the current. The effect of this dam will be as follows: The branches of the second tree will interlock with the first, and the third with the second, and so on, forming a mass which will catch the floating drift and sediment, and establish a permanent rack-heap. There will then form a bar below and behind, while the surface of the tree presents an inclined plane to throw the current to the surface. The action of the weather and ice will rot and grind it off to low water mark, so that when the river rises above low water, the surplus will go over without injury; and when it falls to a moderate stage, the water will be forced down the channel and clear it out.

We, the undersigned, being practically acquainted with the Mississippi River, believe the plan set forth by C. M. Scott, of an Artificial Rack Heap Dam, to be the best plan yet originated to improve the Mississippi River, between St. Louis and Cairo, and take pleasure in recommending it to the public. We would also recommend Ste. Genevieve as the best and cheapest place at which to test it.

Isaiah Sellers, *Steamboat Scott*; W. W. Greene; J. Throckmorton; Thomas O’Flaherty; Robert Smith, *Steamboat Columbus*; Alex. Norton; R. C. Young, *Crescent*; W. H. Fulton; John Durack.”

Now that the Government has in service boats “capable of hoisting the largest trees,” and is engaged in cutting from the banks of the river every year thousands of trees to prevent the formation of snags, it is worth while to consider whether these trees may not be

towed to points where artificial bars are needed to clear out those which nature has formed, and there hoisted into position and anchored. It would cost little to try the experiment, with machinery already in use. If it should prove effective, and many of the most experienced and intelligent river men of this day believe that it would, the cost of needful improvements would be much diminished. Mr. Scott, who has had some experience on snag-boats, estimates that the cost of fastenings to hold the trees in position would not be more than \$20 each, and that one of the snag-boats in use could hoist and anchor in position at least four trees per day. These boats cost about \$100 per day while in operation. As only 180 trees of good size would suffice to cause a permanent bar or dam a mile in length, there seems reason to believe that in many localities this method of confining the stream, as recommended by Gen. Simpson, may prove more economical than any other. In fact, Mr. Scott believes that such dams will cost not more than \$10,000 per mile. The suggestion seems the more worthy of attention in view of the marked success of one of the United States officers, Capt. John B. Davis, in clearing away by a similar method, with only ten days' work, one of the worst bars in the upper river below St. Paul. Two apparent advantages of this method of effecting the confinement of the channel proposed by Gen. Simpson will be observed: the branches of trees check the current enough to cause it to deposit sediment, but, it is thought, not enough to cause the sharp rebound of the current against the opposite shore, which renders protecting works necessary there; and the trees, forming a partial obstacle only, do not cause any reacting eddy behind them or scouring-out of the bottom sufficient to dislodge them. Since nature builds dams in that way at no expense, it is worth while to ask whether man cannot build them by the same method at small expense.

But as to the best method of effecting improvements scientific investigation and practical experiment must decide; the estimate by the U. S. Engineer will in this case, as in all others, be accepted as that of the highest authority as to the cost of proposed works. Similar improvements, though by no means as numerous, will be required between Cairo and Memphis, however, of which no official estimate is known to have been made. It will, therefore, be assumed that in this portion of the river, upon which a deeper channel is naturally maintained with fewer interruptions, a channel of ten feet depth may be obtained at two-thirds the estimated cost between St. Louis and Cairo, so that the whole cost from St. Louis to New Orleans, would be five million dollars. Adding the

cost of the snag-boats, the building of which is recommended, and \$384,000 for two years' work according to the estimate of Major Suter, in order to test thoroughly the efficacy of the plan proposed by him, and adding further the sum (\$7,500,000) by the officer in charge stated as the probable cost of the Fort St. Philip Canal, we have \$13,484,000 as the entire cost of improvements thus far considered.

In the Illinois River, from its mouth to Henry, the foot of the lock-system, there are, according to the report of 1873, from the Engineer in charge, sixteen bars requiring removal. In this stream, excepting at a few points, the bottom is of hard blue clay, and when a channel is once cleared it remains for many years. Points improved by dredging twenty-five years ago, navigators testify, now remain in as good condition as when the work was finished, and all agree that great service has been rendered by the dredging operations conducted by the United States authorities. The Engineer in charge has officially reported that \$350,000 will complete a channel giving four feet draught from Henry to the mouth, and that \$12,000 a year will afterwards keep the channel in condition permanently. With that depth, the vessels now navigating the stream can bring out at all times 700 tons at a trip, and as six cents per bushel is now a liberally paying rate from Henry, and the usual charge on general freight from the mouth of the river to Chicago is only 14 cents per cwt., or 8½ cents per bushel, it is safe to say that the expenditure of \$350,000, as proposed, will make it possible to move grain, at any time when the river is not frozen, for six cents per bushel from any point to the Mississippi. Navigation opens about the middle of February, and closes from the first to the 15th of December; for three full months prior to the opening of the Erie Canal, and for two to four weeks after it has closed, the immense quantity of corn grown within reach of this river will therefore have an outlet by water southward only, and at all times a choice of routes and of markets.

A few improvements by dredging and wing-dams, in the channel of the Upper Mississippi, would greatly reduce the cost of transportation from St. Paul or Winona southward after the improvement of the Des Moines Rapids has been completed. No official estimate of the cost is known, but the number of points at which attention is especially required is stated, by those experienced in the navigation, to be not more than eight. The ease with which they can be improved is illustrated by the success of Capt. Davis in clearing the obstruction known as Pig's Eye Bar; by fastening light

trees or brush, with the tops down stream; in ten days' work he so improved the channel that packets went through to St. Paul. About \$20,000 each suffice to construct the wing-dams in use on the Wisconsin River, and should such works be needed or advisable at the bars in the Mississippi, a comparatively small sum would suffice for the clearing of such a channel that the barges now in use on the upper river could at all times take full loads, and the navigation would be interrupted only when the river is closed by ice. The following table gives the date of opening and closing of navigation to St. Paul each year since 1848, showing that even from that distant Northern point grain can be shipped southward at least one month earlier in the spring than by way of the lake and Erie Canal. From Winona and other points nearer the great wheat-growing counties, the season is still longer:

YEAR.	Arrival of first Boat.	Name of Boat.	Departure of last Boat.	Length of Season.
1849.....	April 9.....	Highland Mary....	November 19	224
1850.....	" 10.....	" ".....	" 18	214
1851.....	" 1.....	Nominee.....	" 20	238
1852.....	" 16.....	".....	" 10	200
1853.....	" 11.....	West Newton.....	" 22	225
1854.....	" 8.....	Nominee.....	" 23	229
1855.....	" 18.....	War Eagle.....	" 19	317
1856.....	" 17.....	Lady Franklin.....	" 10	203
1857.....	May 1.....	Galena.....	" 14	198
1858.....	Mar'h 28.....	Gray Eagle.....	" 16	236
1859.....	April 19.....	Key City.....	" 29	222
1860.....	Mar'h 28.....	Milwaukee.....	" 23	345
1861.....	April 8.....	Ocean Wave.....	" 22	232
1862.....	" 18.....	Keokuk.....	" 15	211
1863.....	" 5.....	".....	" 24	233
1864.....	" 14.....	Hawkeye State....	" 11	211
1865.....	" 15.....	Burlington.....	December 1	240
1866.....	" 19.....	Sucker State.....	November 23	219
1867.....	" 21.....	Itasca.....	" 26	222
1868.....	" 4.....	Sheridan.....	December 1	249
1869.....	" 19.....	Sucker State.....	November 20	216
1870.....	" 11.....	Tom Jasper.....	December 1	235
1871.....	" 10.....	Diamond Jo.....	November 19	223
1872.....	" 23.....	S. S. Merrill.....	" 15	206
1873.....	" 17.....	Northwestern.....	" 12	209

Barge navigation will now be resorted to on the Missouri. It is highly important that the grain of Nebraska and Kansas should be saved the cost of transportation three hundred miles by rail in order to reach the Mississippi, and without doubt the Missouri can be so improved as to afford ample facilities. No known official examination states the cost of such improvements on that river as would

secure the depth of water required by light barges for the movement of grain in bulk, such as are now used upon the Upper Mississippi and Illinois. The distance from Omaha to the mouth of the Missouri, 666 miles, and from St. Paul to the same point, 658 miles, are nearly equal, and grain has even now been moved at times from St. Paul to St. Louis for seven cents per bushel. It seems not unreasonable to hope that by means of improvements on both rivers, securing a moderate depth of water at all seasons, grain may be moved from the two important grain districts west of the Mississippi to this point at a cost for transportation, (after reaching the river,) not greater than seven cents. But during the last summer the rate from St. Paul to Chicago, by barge and rail, was 16.8 cents per bushel, and by rail it was raised from 18 to 21 cents per bushel, while the published rail rate from Omaha, for the spring and summer of 1873, was 35 cents per 100 lbs., or 21 cents per bushel. It is entirely within the power of the people, through their State Governments, to prevent the unjust discriminations in rates, by which, in some cases, the railways have practically refused to take grain to points on the rivers for shipment there, and that subject need not here be discussed. It would seem, also, that the improvement of the Des Moines River, so long disused, by which 200-ton boats were enabled to reach Des Moines, might deserve attention from the producers of Iowa, especially as the crop-maps indicate that such a navigable channel would afford an outlet to the corn-belt of great fertility in the western part of the State, and to the southern border of the great wheat-producing district. The improvement of the Wisconsin, already commenced by the Government, deserves sufficient appropriations to carry it forward with vigor. The report of Maj. Houston, of Dec. 28th, 1871, stated that \$426,044 would suffice to secure "a reliable navigation of at least four feet, and in all probability five feet." In this case, as in that of the Illinois, if the general plan of improvement adopted by the Government should contemplate the use of the natural currents for navigation by fleets of barges southward, the cost of works would be comparatively small, while transportation at less cost to the Mississippi could probably be secured from these rivers by that method than to the lakes by a system of locks by which the use of fleets of barges would be prevented, and the aid of the natural current for outward cargoes rejected.

The improvements in progress on the Ohio have already facilitated materially the navigation of that stream, and no similar work as yet completed by the Government has given more general public

satisfaction than the canal around the falls at Louisville. It is hoped that without farther delay all private ownership in this great work may be extinguished, and the tolls removed altogether. On the upper portion of the river, above the mouths of the Miami and Scioto, extensive works of improvement are under consideration, with what result the latest report of the engineer in charge (not here accessible as yet), will doubtless show. But the navigation of that portion of the stream, exceedingly important as it is, does not come within the limits especially marked out for this paper, since it is not required to facilitate movement of the surplus products of agriculture. For the improvement of bars by the methods hitherto in use, the engineer in charge, in his report of June 30th, 1872, recommended an appropriation of \$350,000, and only a part of that sum would have been applicable to the stream from the Scioto and Miami valleys downward. But including the whole of it, with \$700,000 each for improvements on the upper Mississippi and Missouri, of which no official estimate is known, we have an aggregate of about sixteen millions, thus:

Fort St. Philip canal, official estimate to complete.....	\$7,500,000
Mississippi, from the Ohio to the Missouri, official estimate, to complete.....	3,000,000
Mississippi, below Cairo, estimate	2,000,000
“ upper river, “	700,000
Missouri “	700,000
Wisconsin, official estimate, to complete	426,000
Illinois “ “ “ “	350,000
Ohio, official recommendations (not to complete).....	350,000
Snag-boats, rebuilding.....	600,000
“ operations two years.....	384,000
Total.....	\$16,010,000

It is not believed that the whole sum here stated could be advantageously expended or appropriated at once, and in respect to the upper Mississippi and Missouri, and the Mississippi between Cairo and Memphis, the sums named are not based upon official estimates, and may exceed the whole amount required in order to secure the needed improvements of those channels. Moreover, the works upon the Wisconsin, Illinois and Ohio have been already undertaken, not as part of the comprehensive plan herein discussed for the purpose of making the Mississippi river and its chief tributaries available as a national highway for the surplus agricultural products of the northwest, by which existing routes are now overcrowded, and hence the cost of such works might properly be omitted from consideration as part of the cost of that plan. And again, the operations of the snag-boat fleet are necessary to the commerce of the West in any event, and appropriations for the building of new boats will in any event

soon be necessary. On the other hand, the cost of the operations proposed by Major Suter, is included for only two years, because that plan should rest upon its own merits if it proves effective, and two years with ample appropriations will suffice to test it thoroughly. But with the estimates here included, the navigable waters of the Mississippi valley can be so improved as to afford to every surplus-producing region in the Northwestern States, Michigan excepted, a natural outlet, a choice of markets and of routes, and competition with the railway system, beginning even at St. Paul one month earlier in the year, and everywhere extending later, than the competition heretofore offered by the Northern route, which has now proved ineffective except within narrow limits as to time and space.

Sixteen millions will give to the farmers of the West and the consumers of the East a route, which unlike any other by water as yet contemplated, shall reach all the great surplus-producing districts of the West; which unlike any other, shall reach nearly every important city or manufacturing center in the East, which shall be open the whole year from Cairo, excepting an average of eighteen days in the year from St. Louis, and longer by more than a month than any other route by water from St. Paul; and by which the bulky products of agriculture may be moved at much lower cost than by any other mode of transportation known to civilization.

It is a custom, perhaps "more honored in the breach than in the observance," to present estimates of the cost of transportation which may be attained by proposed routes and methods. Thus far, it has been rather the object of these pages to present the facts from which every intelligent reader may judge for himself, as to the probable cost of transportation which may result from improvements desired. Rather as a summary of the points which those facts seem to establish than as an estimate of results possible or probable, it may here be added:

I. That rates from New Orleans, now relatively much higher than rates from New York, may probably be reduced one-fifth by the completion of an effective improvement of the mouth of the river.

II. That rates thence to New York, now very variable, may probably be thus reduced to \$3.00 or \$3.30 per ton, or nine to ten cents per bushel.

III. That transportation from St. Louis to New Orleans, hitherto \$1.65 per ton at the lowest, may probably, with full development of this route, be effected with fair profit to the transporter for \$1.00. But if improvements should only result in establishing rates as low

as the lowest actually reached hitherto, the cost from St. Louis to New York would be sixteen cents per bushel (one cent included for transfer by floating elevator), and to Liverpool twenty-six cents per bushel.

IV. That the cost of transportation by lake and canal, since the reduction of tolls on the canal, has averaged by lake $8\frac{22}{100}$ cents, by elevator, 2 cents; by canal, $12\frac{31}{100}$ cents; total, $22\frac{53}{100}$ cents to New York. Transfer and charges there 4 cents, thence by ocean 20 cents; total, to Liverpool, $46\frac{1}{2}$ cents per bushel.

V. The usual rate in summer from the wheat region of Minnesota, Western Wisconsin and Iowa to the lake has been 12 cents per bushel, by barge and rail, which with 2 cents for transfer makes $36\frac{1}{2}$ cents to New York, and $60\frac{1}{2}$ cents to Liverpool.

VI. If improvements should only result in rendering practicable the lowest rate yet known to St. Louis, 7 cents, from St. Paul, the cost (with transfer, 2 cents) would be 25 cents to New York, and 35 cents to Liverpool.

VII. The usual lowest summer rate from the great corn district of Illinois by rail eastward (according to published rates) has been about 55 to 60 cents per 100 lbs. in summer—low enough to give to the all-rail route a slight advantage over the cost *via* rail to the lakes and thence eastward. These rates, however, are in force but a short time in each year.

VIII. As the greater part of this corn district lies nearer to the river than to the lakes, so that the cost of transportation to the river would at reasonable charges be somewhat less, the effects of the competing southern route would be in midsummer even greater than the difference supposed between the cost by lake and river routes, namely, $6\frac{1}{2}$ cents to New York and $20\frac{1}{2}$ to Liverpool.

IX. But during the other months in the year, when all rail-rates eastward rise to 65, 75, or at times 80 cents per 100 lbs. from points in this corn district, the value to the producers of an open route by water southward would greatly increase, and during the whole year exceed ten cents per bushel.

X. In like manner, during the season (commencing about Sept. 1st) in which the route by canal being over crowded, the rates by lake, canal and rail rise rapidly, and from that time forward until the close of navigation from St. Paul by river, and after its opening in the spring until navigation by lake also opens, the value of the competition offered by the southern route to the wheat producers of western Wisconsin and Minnesota, and the wheat and corn producers of Iowa, Nebraska and of the river counties of Illinois would greatly increase,

and in the yearly average would much exceed ten cents per bushel.

XI. The value of a similar competition to the producers of southern Ohio and Indiana, if only sufficient to cause rates by rail eastward from river points, as low as are now granted from lake points at equal distances, would be equivalent to five cents per bushel.

XII. Estimating the average value of that competition through the year, at only ten cents per bushel for the surplus grain of States west of the river, and south of the line of equi-distance by cost of transportation in Illinois, and at only five cents per bushel for the surplus grain of western Wisconsin and southern Ohio and Indiana, and that part of the corn of Illinois which, though not south of the line of equi-distance to St. Louis or the lake, is, nevertheless, nearer to the river than to the lake, the yearly value to the producers of each State may be thus stated:

Southern Indiana.....	\$148,000
Southern Ohio.....	784,000
Western Wisconsin.....	661,000
Kansas.....	253,000
Nebraska.....	349,000
Missouri.....	875,000
Iowa.....	2,500,000
Minnesota.....	2,785,000
Illinois.....	8,562,000
Total	\$14,920,000

There still remains the value of a reduced cost of transportation upon packed meats, which may be borne southward by river, and shipped from New Orleans, or, through the competition offered by that route, may obtain lower rates eastward. If the difference of rates should be only that now existing between river and lake ports equally distant from New York, viz., 7 cents per 100 lbs. on grain, it would amount, upon 334,853 tons of packed meats produced at points near or upon the river, to \$468,794 yearly. A further benefit would be realized to the producers of southern crops, from the reduced cost of transportation from New Orleans; if we suppose that reduction equivalent to only one-fifth of the present rates on grain to New York, or about 80 cents per ton, it will amount to \$662,412 upon the crops of tobacco, cotton, sugar, and molasses and hemp. The yearly value of improvements, estimated to cost \$16,010,000, would then be \$16,051,206. The entire outlay necessary would be returned in a reduction of the cost of transportation every year thenceforward. Neither the producers alone, nor the consumers alone, would enjoy it exclusively. As political economy teaches that all burdens are finally distributed, so every real and genuine public bless-

ing, through removal of burdens previously existing, must in the end be distributed, and shared by the people of the whole country. It is not often that either the Government or any individual has opportunity to make an investment which promises to return one hundred per cent. each year. Even here the enormous gain which these figures illustrate is in reality only the removal of a tax which this nation has for years been paying in consequence of its neglect to utilize the gifts of Providence to the people of this country. But not the less will the removal of that burden be a real and substantial benefit, worth every year all that it will cost; not the less do the measures by which it may be attained deserve the most careful consideration from the people and their Government.

Since the first edition of this Memorial was published, it has been endorsed, and its objects commended to the favorable consideration of Congress, by the Legislatures of Missouri and Iowa, by the Merchants' Exchange of Paul, and by the commercial bodies in Burlington, Muscatine, and several other cities. The resolutions passed by the Legislatures of Missouri and Iowa, and the Merchants' Exchange of St. Paul, are given below; official copies of those passed by other bodies have not been as yet received:

RESOLUTIONS OF THE MISSOURI LEGISLATURE.

Concurrent Resolution in relation to the Memorial of the Union Merchants' Exchange of St. Louis, concerning the Mississippi Valley.

WHEREAS, a memorial from the Union Merchants Exchange of St. Louis, with accompanying appendices, setting forth the necessities of the Mississippi Valley in respect to the transportation of their products and the improvements of their natural channels of communication, has been transmitted by the Governor to this body for its consideration; and

WHEREAS, the complete and comprehensive view of the facts therein contained, conclusively proves that the improvement of the Mississippi River and its tributaries will go far toward solving the vexed question of transportation, affording to the people of different sections of our country the opportunity for interchange of their products at less cost, and to the producers of the West, especially, a choice of markets, and a better price for the fruits of their industry; and

WHEREAS, the measures therein advocated are in the highest degree national in character, and of peculiar importance, not alone to the people of Missouri, but to the people of every State of the Valley of the Mississippi; therefore,

Be it Resolved by the Senate, the House of Representatives concurring therein,

First. That our Senators from this State be instructed, and our representatives in Congress requested, to urge in the Congress of the United States the opening of the mouth of the Mississippi River, so that a clear channel of sufficient depth for the largest vessels of commerce may at all times be maintained; the immediate completion of works in progress at the Des Moines and Rock Island Rapids; the removal of obstructions from the channel of the Mississippi River, according to the recommendations of the United States engineer in charge, so that a channel of not less than ten feet in depth may at all times be maintained below the mouth of the Missouri, and the improvement of the chief tributaries of the Mississippi, and of the upper portion of that river, so that the main channel may become accessible as a highway for commerce to the people of all the States of the Mississippi Valley; and the appropriation of such sums as may be necessary to carry forward without delay this great work of national importance.

Second. That a copy of these resolutions be transmitted by the Secretary of State to our Senators and Representatives in Congress, and to the presiding officers of the Legislatures of all other States in the Mississippi Valley, with the earnest request that they will concur with the Legislature of Missouri in urging the measures herein contemplated.

Resolved further, That the Governor be instructed to empower such person as may be recommended by the Central Committee of the Union Merchants' Exchange of St. Louis, to proceed as Commissioner on behalf of this State, to invite the especial attention of the Legislatures of Illinois, Iowa, Kansas, Nebraska, Minnesota and Wisconsin, to the necessity of the improvement of the Mississippi River and its tributaries, and to urge concurrent action with this Legislature in its recommendations upon this subject, before the adjournment of the present session of Congress; and that the actual expense of said Commissioner, without salary, while employed in this mission, shall by the State Treasurer be refunded to him, upon his certificate of the amount, with the approval of the Governor, provided, that the sum so paid shall not exceed five hundred dollars.

RESOLUTIONS OF THE IOWA LEGISLATURE.

Joint Resolution in reference to the improvement of the Mississippi River and its tributaries.

Whereas, the Mississippi River and its tributaries, are the great national highway for the transportation of the surplus products raised by the people of twenty States and territories; and

Whereas, the improvement of the main channel and the mouth of said river is imperatively demanded, to the end that vessels of greater tonnage may be admitted thereon, thereby securing better and greater facilities for carrying such products with cheaper rates for the same; and

Whereas, the speedy completion of the work of the rapids of the upper Mississippi, in conjunction with such improvements of the Ohio, Missouri and other tributaries as shall make its main channel more accessible, will secure to the agricultural interests of the country an increase in the value of their products, by a reduction of the cost of transportation; therefore be it

Resolved, by the General Assembly of the State of Iowa, that our senators in Congress be instructed, and our representatives requested to vote for such measures as will best accomplish the results so much desired.

Approved, February 18th, 1874.

CHAMBER OF COMMERCE. }
ST. PAUL, MINN., Feb. 10, 1874. }

GEO. H. MORGAN, *Secretary Merchants' Exchange.*

Dear Sir:—Below you will find the action taken by this chamber, as referred to in my former and last letter:

WHEREAS, the State of Minnesota produced more wheat in 1873 than any other State in the Union, and the Mississippi River being one of the great outlets thereof,

RESOLVED, That the Chamber of Commerce, of the city of St. Paul, most urgently commends the memorial of the St. Louis Union Merchants' Exchange, for the improvement of the Mississippi River and its tributaries, to the favorable consideration of the Congress of the United States.

On motion, the Secretary was instructed to convey a copy of the above to the Congressional delegation.

[Signed.]

H. T. JOHNS, *Secretary.*

